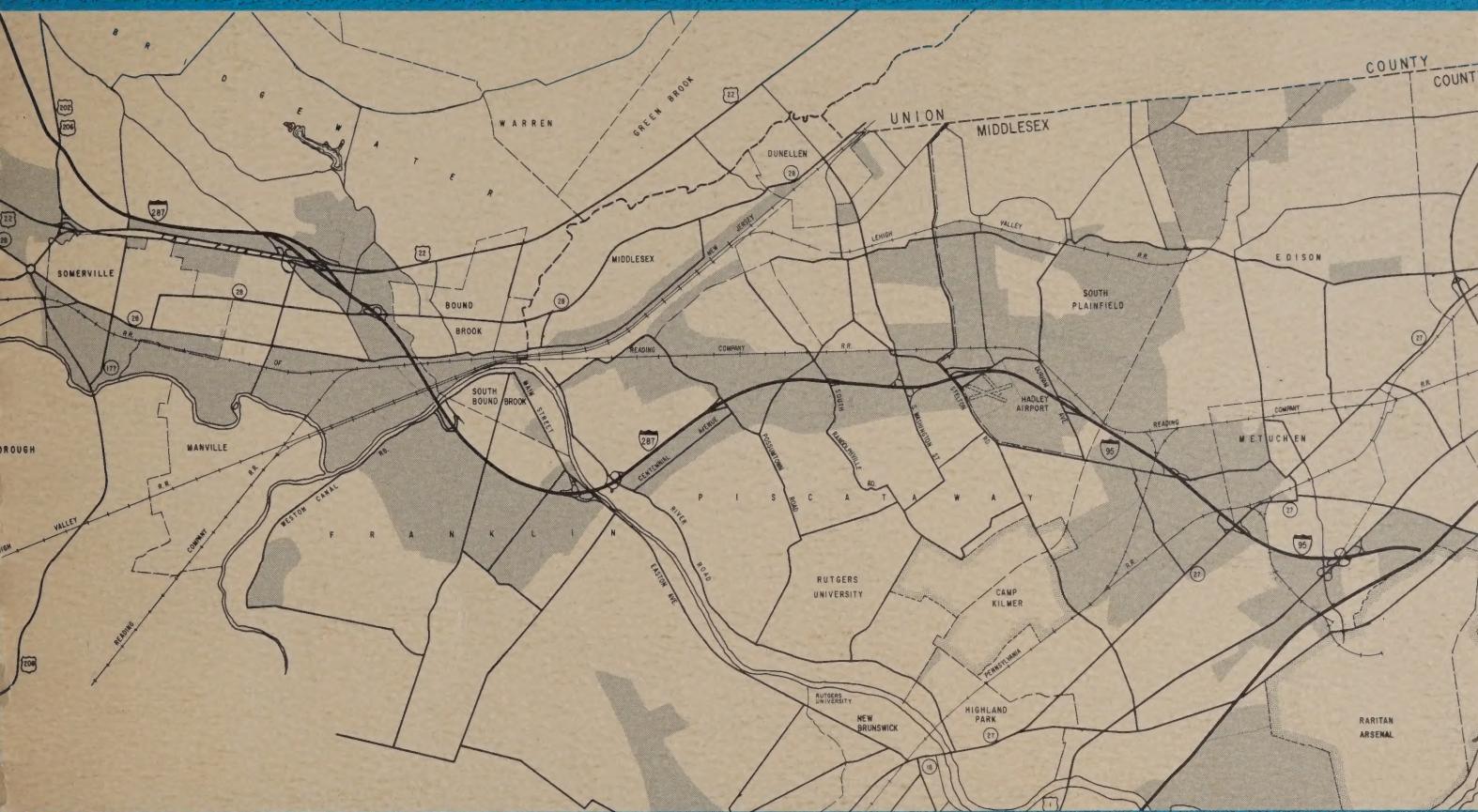


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# A SOCIOECONOMIC STUDY OF HIGHWAY DEVELOPMENT

I-287, I-95 CORRIDOR  
MIDDLESEX and SOMERSET COUNTIES  
NEW JERSEY — 1967

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*Bur Smith and Associates*



**A SOCIOECONOMIC STUDY OF HIGHWAY DEVELOPMENT  
I-287, I-95 CORRIDOR  
MIDDLESEX and SOMERSET COUNTIES  
NEW JERSEY - 1967**

**Prepared For**

**New Jersey Department of Transportation**

**By**

***Wilbur Smith and Associates***

**March 1968**

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# *Wilbur Smith and Associates, Inc.*

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CONSULTING ENGINEERS

4500 JACKSON BLVD.

Columbia, S.C. 29202

March 22, 1968

Mr. David J. Goldberg  
Commissioner  
New Jersey Department of  
Transportation  
1035 Parkway Avenue  
Trenton, New Jersey 08625

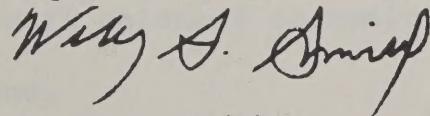
Dear Commissioner Goldberg:

We are pleased to submit our report, A Socioeconomic Study of Highway Development, I-287, I-95 Corridor, Middlesex and Somerset Counties, New Jersey-1967, in accordance with our agreement dated October 13, 1967. The detailed study of a section of I-287, I-95 in Middlesex and Somerset counties revealed the role of this freeway in contributing to the economic and social development of the area it traverses. The study also considers the role that limited access highways in New Jersey have played in the economic and social development of the state. Other impact studies with findings relevant to New Jersey have been reviewed in this volume.

We would like to express our sincere gratitude to the staff of the New Jersey Department of Transportation, and other state, county, and local agencies for their cooperation in supplying data necessary to this report.

We appreciate the opportunity of conducting this important impact study and trust that our findings will be of assistance to your program of facility improvements and in the continuing transportation planning process.

Respectfully submitted,



Wilbur S. Smith

Registered P.E.  
New Jersey No. 10470



## SUMMARY

New Jersey, her citizens, and her economy have been the beneficiaries of the state's system of limited-access highways. New Jersey is one of the nation's most densely populated, most heavily industrialized, and fastest growing states. Just as the transport systems of the past, the Interstate System is today pointing the direction for growth of population, commerce, industry, and government. This study shows, through a detailed analysis of the area near a section of I-287, (I-95) in Middlesex and Somerset counties, some of the manifestations of this guiding influence. The area traversed has experienced an in-migration of industry, commerce, and persons which can be directly related to the accessibility the highway provided. Through this same attribute, the highway has expanded the social, cultural, recreational, and employment horizons of those it serves.

Land values, land use, and land investment near the highway have increased substantially affecting increased municipal tax revenues, assessed and equalized valuations. By the same token, municipal governments have recognized the highway as a tool to be used for the development of a well balanced economic base, socially viable, and fiscally sound.

Industry has found that freeways, particularly when constructed through areas with low levels of land use, provide a

number of good sites suitable for relocation and expansion. Because of the highway, these sites provide excellent access to clients, customers, labor, and also provide good site visibility. Improved accessibility for industry results in reductions in transport time, man-hours in transit, inventory, capital requirements, and interest costs. With increased industrial economies, virtually all external sectors benefit.

Residential developers involved in properties near the highway have experienced strong demands for housing due largely to the migration into the area of population from more densely inhabited areas. Freeway proximity and accessibility to employment, commercial, social, cultural, and recreational centers throughout the region were credited with stimulating this demand.

Just as crossroads, ports, and railroad terminals used to be favored locations of retail businesses, suburban highways and freeways, such as I-287, particularly at points of interchange, are favored locations of shopping centers, a phenomenon of the automobile age. In recent years, New Jersey has witnessed a virtual explosion in shopping center activity. The Interstate System has been found to expand the market areas of existing centers and to stimulate the investment in new centers.

With increased efficiency, speed, and safety, the freeway system enhances the mobility of the factors of production

and is often the deciding factor in decisions concerning the location or investment in new or improved facilities. As accessibility has been the predominant force fomenting the industrial development of much of the I-287, I-95 corridor, other limited-access highways in New Jersey have effectively influenced the economic future of many of the state's municipalities. The New Jersey Turnpike, carrying over 70,000,000 vehicles annually, connected New York with Philadelphia, Baltimore, and points south and encouraged the economic development of much of the area it traverses. The Garden State Parkway is credited with substantially revitalizing the economies of the counties it serves, especially the shore areas. The Atlantic City Expressway, although relatively new, has stimulated additional investment not only at its shore terminus but also at various points along its corridor.

Studies of freeways in the United States have shown a multitude of effects promulgated by the location and accessibility of these systems. Users have been shown to be direct beneficiaries through substantial user savings and significantly reduced accident costs. Freeways have aided in the reorientation of central urban areas while setting up a hierarchy of land uses as they traverse less densely developed areas. Freeway bypassed communities have been affected to varying degrees depending

on the local economy, freeway access, and freeway location. Because freeway users have obvious commercial needs, many interchanges have experienced considerable commercial development.

Throughout the nation, freeway systems have improved accessibility to regional, local, and individual tourist attractions. In recent years, increased leisure times and disposable incomes have resulted in greater demands for recreational activity and increased travel to satisfy these desires.

It can be stated with reasonable assurance that the Interstate and other freeway systems have served as the catalyst for tremendous economic development in many regions of the nation. It is axiomatic that the mobility and accessibility provided by freeways will be the vital element of a transportation system upon which the future economic growth of communities, states, and the nation will be dependent.

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## Chapter 1

### INTRODUCTION

Highways are not new nor is their effect on our lives unknown. Highways are considered in different terms by different people. To engineers they are a challenge to design and construct; to a planner they are a tool to be used with caution to solve local problems and influence future growth; to an economist they represent an investment which can have significant effects on the local, regional, and even the national economy; to the employed they provide convenient pathways to places of employment and home again, to the housewife they represent a pathway to the shopping centers, to school, to family and friends, and at vacation time they can broaden the area of individual and family recreational pursuits. Highways have many facets which have been recognized for some time, but it has only been in recent decades that highways have been studied in any terms other than least cost with one constraint, good engineering.

#### Purpose of the Study

This study is part of an evaluation undertaken for the New Jersey Department of Transportation designed to determine and evaluate some of the socioeconomic aspects of highway

development in New Jersey. Freeways and other limited access facilities in New Jersey have had an important role in the economic development of the entire state and areas within the state. The purpose of this study is to investigate social and economic changes which may be attributed to New Jersey's system in general and for selected sections of Interstate Routes 287 and 95 in particular.

#### Nature of the Study

Much of the time required for preparing this report was spent in New Jersey, particularly in the I-287, I-95 corridor in Middlesex and Somerset counties. This was necessary since much of the data used have never before been collected, analyzed, or published in one study. A number of areas of socioeconomic impact were investigated, including an analysis of trends in the economic growth and development of New Jersey with emphasis on Middlesex and Somerset counties. Changes in land use and recent land development to higher economic uses were observed and plans for future land development were recorded. This was investigated in detail in the areas adjacent to the section of I-287, I-95 being considered. Also related to this freeway were changes in population growth and concurrent residential development. Growth in the economic activity of an area can also be

related to changes in land values. The effect of the highway in terms of work trips, shopping trips, and social-cultural use was also considered.

To provide a complete picture of the effects of limited access highways on the area they serve, other impact studies prepared by various researchers were reviewed with consideration to similar facilities in New Jersey.

From this compilation, synthesization, and analysis a rather comprehensive summary of the sociological benefits of freeways in New Jersey was generated.

#### The Study Area

The primary area in which this study was concentrated included Middlesex and Somerset counties. Until recently these counties were considered as being at the very fringe of the metropolitan area now called the New York-Northeastern New Jersey Standard Consolidated Area which includes New York City, and Newark, New Jersey.

Specifically the study concentrates on that portion of I-287, I-95 in Middlesex and Somerset counties bounded on the

east by U.S. Route 1 at Metuchen and on the west by U.S. Route 22 in Bridgewater Township near Somerville.<sup>(1)</sup> The study highway is about 13 miles in length and is served by 13 interchanges with connecting arterials. As defined, the study corridor extended in each direction for a distance of 3 miles of the interchanges and 1 mile of the right-of-way.

Included in the I-287, I-95 corridor were the following municipalities: Edison Township, Metuchen Borough, South Plainfield Borough, Piscataway Township, Franklin Township, Dunellen Borough, Middlesex Borough, South Bound Brook Borough, Bound Brook Borough, and Bridgewater Township. Although all of these municipalities are not traversed by I-287, they were considered to be within the area of influence of I-287.

The socioeconomic characteristics of New Jersey are briefly reviewed in the next section followed by a detailed consideration of the socioeconomic setting of Middlesex and Somerset counties. Following this there are three chapters which consider in detail the findings of this investigation and a summary of study results.

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(1) For the sake of brevity and to avoid confusion, I-287, I-95 will normally be referred to as I-287 except when it is referred to as the I-287, I-95 corridor.

## Economy of New Jersey

The industrial base, geographic location, and historical developments in New Jersey have resulted in the state enjoying an enviable economic position in the developing Megalopolis of the Northeast. The economic base of the state is quite diverse, with agriculture, heavy and light industry, and commercial enterprise all playing an important role in a reasonably well-balanced economy.

Population- The 1960 population of the state totaled 6,067,000, an increase of 25.5 per cent over 1950, and by 1966, the estimated population was 6,898,000, an increase of 13.7 per cent over 1960. At the present time, New Jersey has the highest population density of all states. In 1960, 88.6 per cent of the population resided in urban areas. Sixty-seven per cent, over 4 million persons, of the total state population, resided in the New York-Northeastern New Jersey Standard Consolidated Area which includes Middlesex and Somerset counties. This area experienced a population growth of 708,745 (21.1 per cent) from 1950 to 1960. Population in Middlesex and Somerset counties, however, increased by 63.8 and 45.3 per cent, respectively, during the same period.

Employment- Nonagricultural employment increased by 420,800 during the period 1960-1966, representing an 18.3 per cent increase with the employed total in 1966 reaching 2,791,000.

Increased accessibility and a general increase in efficiency have made it possible for agricultural productivity to increase at a faster rate than nonagricultural industries, releasing farm workers for the labor force. Approximately 30 per cent of all farm operators work off their farms 100 days or more during the year. A third of all farm operators report an income greater than that received from farm products. Agricultural employment has consistently decreased and in 1960 totaled only 34,200 persons in New Jersey.

Income- Per capita income in 1965 was \$3,237, considerably higher than the \$2,748 for the nation as a whole. For the period 1960-1965, the per capita income growth has been 19.5 per cent, somewhat lower than the growth rate of 24.0 per cent experienced by the nation. Although the growth rate in recent years has been lower than for the nation, per capita income is still substantially above the national average.

Transportation- Pressures on highway transportation systems in the state are increasing at an extremely rapid rate. Motor vehicle registrations increased from 2.1 million vehicles in 1960 to 3.1 million in 1966, an increase of 47.6 per cent. Vehicular travel increased from 23.2 billion vehicle-miles in 1955 to 34.5 billion in 1966, up 48.7 per cent.

The transportation system of the state, as befits a mature economy, is varied and some modes appear to have adequate capacity to meet demands. Rail and water transportation appear capable of handling all goods movements designated for such modes. The commuter railroads are in need of systematic improvement and will probably need to be subsidized for an indefinite period. Results of the high speed ground transportation experiment between New York City and Washington, D. C. will be watched with interest.

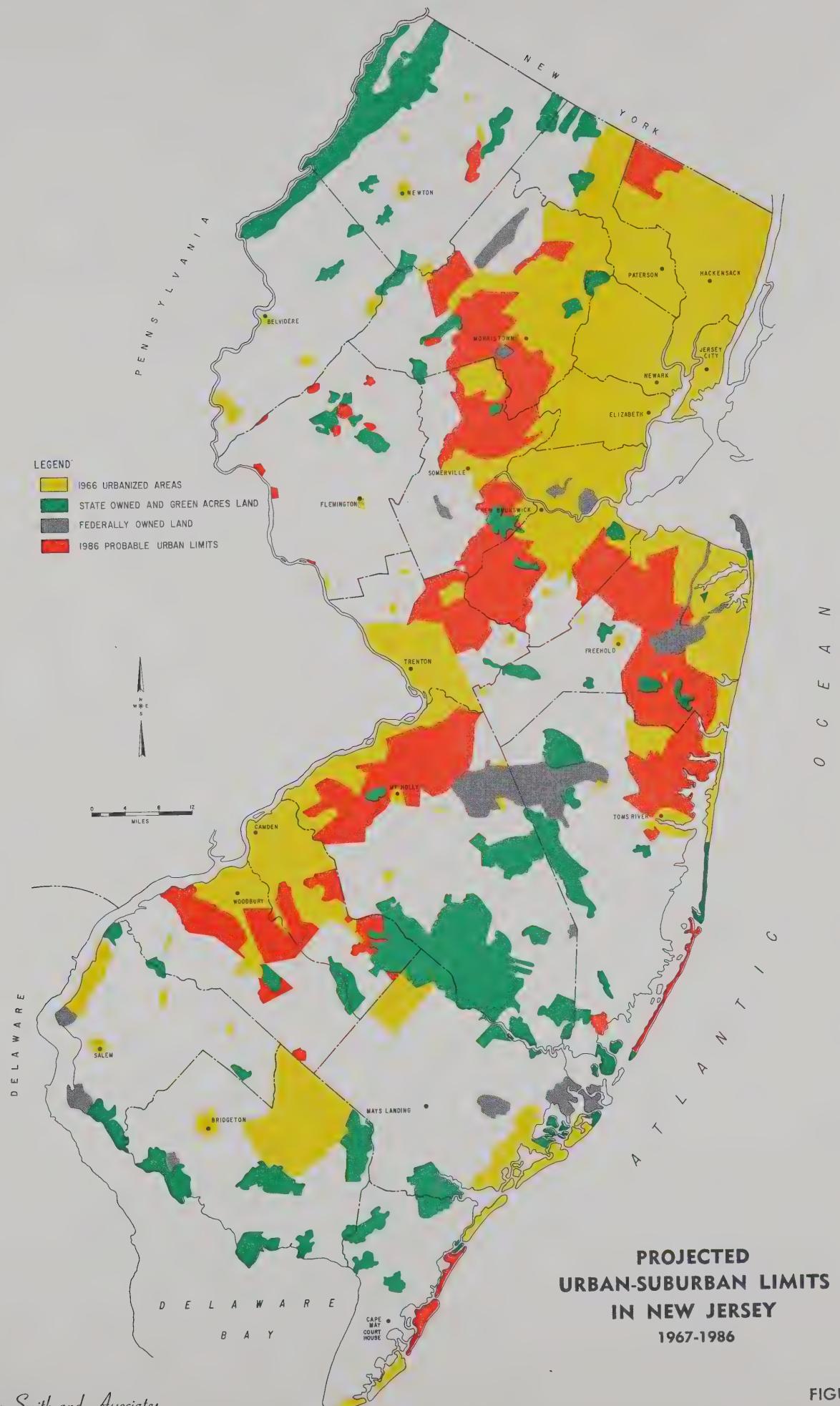
Airports of the state are overshadowed by the eminence of Newark International although the state has a total of 79 airports. The crowded airspace in the Newark area, the impending introduction of the "Jumbo Jets" and the interface problem of air and ground transportation pose serious problems to be considered. Furthermore, the encouragement of general aviation airport development is becoming very important in the potential economic development of new industrial areas.

The highway transportation system is, at the present, unable to meet the pressures engendered by public demand. Future highway needs are large and, in order to keep abreast of growing demands, it will be necessary to accelerate the highway construction program.

Future Growth- By 1986, the population of the state is expected to total 9,975,000 persons, an increase of 44.6 per cent over 1966. Of the total population, it is estimated that almost all will reside in urban areas. It is further estimated that no county will have fewer than 200 persons per square mile by 1986. Figure 1-1 shows the projected urban-suburban limits for 1986. It is anticipated that by 1986, 36.7 per cent of the state's land area will be urban or suburban. This compares with 23.6 per cent in 1967.

The number of employed persons is expected to reach 3,704,000 by 1986, an increase of 32.7 per cent over the 1966 total. Per capita income is expected to remain at a higher level, relatively, than the remainder of the nation, as it is today.

The highway transportation systems of the state will be subjected to tremendously increasing pressure of vehicular





ownership and travel. It is expected that by 1986 there will be 5,280,000 registered vehicles, an increase of 68.6 per cent over 1966, and that these vehicles will accumulate 65 billion vehicle-miles of travel, up 88 per cent over 1966.

The projected economic and demographic growth for the state plus the anticipated growth in vehicles and travel emphasize the need for an adequate transportation system, but specifically indicates that it is the highway transportation system which must be developed to standards capable of withstanding the obvious demands that will be placed upon it. Without this capability, economic growth will be stunted and many localities will have little opportunity to develop solid and enduring economic bases.<sup>(2)</sup>

#### Impact of Highway Improvements

Highway impact studies have been conducted for over half a century. In recent years, however, an increasing number of these studies has been conducted, as the importance of both the short and long-range impact of highway networks on the economy was realized. There are still a number of

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(2) For a more detailed study of the state's economy, see Highway Transportation in New Jersey, prepared for the New Jersey Department of Transportation by Wilbur Smith and Associates, 1968.

unanswered questions concerning the socioeconomic impact of highways and opponents of highway improvement programs have a fairly comprehensive list of why such improvements should not be made. There is, however, one important and vital factor which is overlooked in this argument against highways and that is the tempo of modern American society.

The United States is a mobile society where there is a growing dependence on the automobile in all phases of life. This mobility is evidenced by the fact that in 1964, 34 million people (or one fifth of the civilian population) changed residence. Two thirds of the moves took place within the same county, and the other third from one county to another. <sup>(3)</sup>

It would appear that opponents of highway improvements are really opponents of an accepted way of life. It is axiomatic that areas and communities wishing to retain this status quo will lag badly in the upswing of the nation's economy.

Highway Improvement Programs- In evaluating a highway improvement program, it should be clear that highway construction is an economic activity. As such, it requires the basic economic

(3) Economic and Social Effects of Highway Improvements: A Summary, Michigan State University Highway Traffic Safety Center, East Lansing, Michigan, 1961, p. 128.

inputs--land, labor, capital, and management. Because of its basic requirements, highway construction generates income into varied economic sectors. As new income is expended initially, it generates additional new income which is expended or saved. This process is repeated again and again, and the derived expenditure aggregate from three to four times the initial construction costs. The influences of this activity spread throughout the economy and is neither confined nor easily measureable in total on an area or regional basis.

This illustration of the impact of a highway improvement program concerns only the impact of construction and is concerned only with the construction process. The U. S. Department of Labor has found that for each \$1,000,000,000 spent on highway construction, 103 million man-hours of employment are necessary off the site of construction and another 126 million man-hours on the site.<sup>(4)</sup>

New and expanding economic activities are increasingly highway oriented and are taking advantage of the superior transportation opportunities offered by the new freeways. The routes of the Interstate System are opening up new areas for industrial,

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(4) Ibid. p. 11.

commercial, and residential development and are a primary factor in facilitating redistribution of the extremely high population densities in some of the major urban centers. As the result of improved accessibility provided by modern highways, increasingly large areas of rural land is becoming available for modern plant development and the creation of low density residential communities.

The exchange of rural land for urban land has been accelerated by the accessibility created by a comprehensive network of highways and has radically altered the rural-urban complexion of the nation. The rural areas are being changed and reorganized by the influx of urban influences.

Accessibility has been and continues to be a key to the American way of life. Communication and transportation between and among regions have made it possible for the states to become united socially, culturally, and economically. Development follows highways; urban areas extend into rural areas. Because growth follows and changes land-use patterns in areas penetrated by new facilities, extensive long and short-range planning is mandatory. With proper planning, a highway can afford a maximum of economic development to a particular region.

In New Jersey, the highway transportation system is more than ever becoming an integral part of the state's well developed industrial economy. It is important that the extent of impact of an addition or improvement to the system be realized so that long-range planning can take into account the effect of such improvements.



## Chapter 2

### SOCIOECONOMIC CHARACTERISTICS OF MIDDLESEX AND SOMERSET COUNTIES, NEW JERSEY

The section of Interstate Highways 287 and 95 being covered by this study traverses parts of Middlesex and Somerset counties. Specifically, the highway runs in a general east-west direction terminated on the east by U.S. 1 in Edison, and the western study terminus is at the interchange with U.S. 22 near Somerville. The primary focus of this study is to record those changes both social and economic which have occurred near the highway and then to relate the influence of the highway on these changes.

An important part of understanding how and why a highway has impact requires a knowledge of the environment in which this impact occurs.

#### Population

Middlesex and Somerset counties are located in the geographic and economic center of New Jersey. During the past 2 decades, they have participated increasingly in the dynamic growth and change which have occurred in the state and in the New York-Northeastern New Jersey Standard Consolidated Area. Changes in population in the major conurbation, as shown in Table 2-1 for the

Table 2-1

POPULATION OF THE NEW YORK-NORTHEASTERN NEW JERSEY  
STANDARD CONSOLIDATED AREA

1950 - 1960

<u>AREA</u>	<u>1960</u>	<u>1950</u>	<u>CHANGE</u>	
			<u>Number</u>	<u>Per Cent</u>
TOTAL	14,759,429	12,911,994	1,847,435	14.3
New York, N.Y., SMSA	10,694,633	9,555,943	1,138,690	11.9
Newark, N.J., SMSA	1,689,420	1,468,458	220,962	15.0
Jersey City, N.J., SMSA	610,734	647,437	-36,703	-5.7
Paterson-Clifton-Passaic, N.J., SMSA	1,186,873	876,232	310,641	35.5
Middlesex County, N.J.	433,856	264,872	168,984	63.8
Somerset County, N.J.	143,913	99,052	44,861	45.3

SOURCE: 1960 Census of Population, Characteristics of Population, Part 32, New Jersey,  
U.S. Department of Commerce, Bureau of the Census.

years 1950 and 1960, effectively introduce the trends which characterize the kind of growth that the area has and continues to experience.

Area population increased by 14.3 per cent during the decade with all components except the Jersey City, New Jersey, SMSA sharing in the increase. The greatest population increments (63.8 per cent and 45.3 per cent, respectively) occurred in Middlesex and Somerset counties. The population movement away from the large concentrated urban areas into less densely populated areas is quite evident. Table 2-2 shows the magnitude of the trend toward urbanization in the state and the counties in and around the study area.

The total population for the State of New Jersey between 1950 and 1960 increased 25.5 per cent. Urban population increased by 28.4 per cent, while rural increased by only 6.7 per cent. Only two counties--Hudson and Hunterdon--had decreases in urban population. During the 1950-1960 period, almost half of the counties experienced decreases or no changes in rural population.

Total population in Middlesex County increased from 264,872 in 1950 to 433,856 in 1960, an increase of 63.8 per cent. Urban population increased by 70.8 per cent, while rural increased by only 16.3 per cent. During the same period, Somerset County's

Table 2-2

## URBAN AND RURAL POPULATION TRENDS

New Jersey and Selected Counties  
1950 - 1960

	MIDDLESEX COUNTY	SOMERSET COUNTY	HUDSON COUNTY	ESSEX COUNTY	UNION COUNTY	MORRIS COUNTY	THE STATE
Population, 1960	433,856	143,913	610,734	923,545	504,255	261,620	6,066,782
Urban	394,155	89,092	610,734	920,659	504,255	192,616	5,374,369
Per Cent Urban	90.8	61.9	100.0	99.7	100.0	73.6	88.6
Rural	39,701	54,821	0	2,886	0	69,004	692,413
Per Cent Rural	9.2	38.1	0.0	0.3	0.0	26.4	11.4
Population, 1950	264,872	99,052	647,437	905,949	398,138	164,371	4,835,329
Urban	230,739	61,103	647,431	899,232	393,322	93,732	4,186,207
Per Cent Urban	87.2	63.7	99.9	99.3	98.8	57.0	86.6
Rural	34,133	37,949	6	6,717	4,816	70,639	649,122
Per Cent Rural	12.8	36.3	0.1	0.7	1.2	43.0	13.4
Per Cent Increase, 1950 - 1960	63.8	45.3	-5.7	1.9	26.7	59.2	25.5
Urban	70.8	45.8	-5.7	2.4	28.2	105.5	28.4
Rural	16.3	44.5	0.0	-57.0	0.0	-2.3	6.7

2-4

SOURCE: 1960 Census of Population, Characteristics of Population, Part 32, New Jersey,  
 U.S. Department of Commerce, Bureau of the Census.

population increased from 99,052 persons to 143,913. The increase of 45.3 per cent was evenly distributed between urban and rural areas with respective increases of 45.8 per cent and 44.5 per cent. Both counties have enjoyed far greater increments in population growth than has the state as a whole.

The growth in the two counties will continue to exceed the growth for the entire state as shown in Table 2-3. Based on projections for 1968, Middlesex and Somerset counties will have population increments of about 30 per cent each, and the state, 17.3 per cent over 1960 totals. Figure 2-1 shows that from 1960 to 1986 the population of Middlesex and Somerset counties will have increased by 130.5 per cent and 143.2 per cent, respectively. The state's population is expected to increase by 3,908,218, up 64.4 per cent during the same period. The state's growth will become relatively stable, but Middlesex and Somerset counties, because of available land area, will attract proportionately more of the population increases than many other counties, particularly those which have or will have reached a saturation point.

Similar growth trends for the two counties are shown in a recent study made by the Tri-State Transportation Commission.<sup>(1)</sup>

(1) Tri-State Transportation Commission, Interim Technical Report: 4016-1735, Population and Employment in the Tri-State Region, 1940-1985, April 16, 1965.

Table 2-3

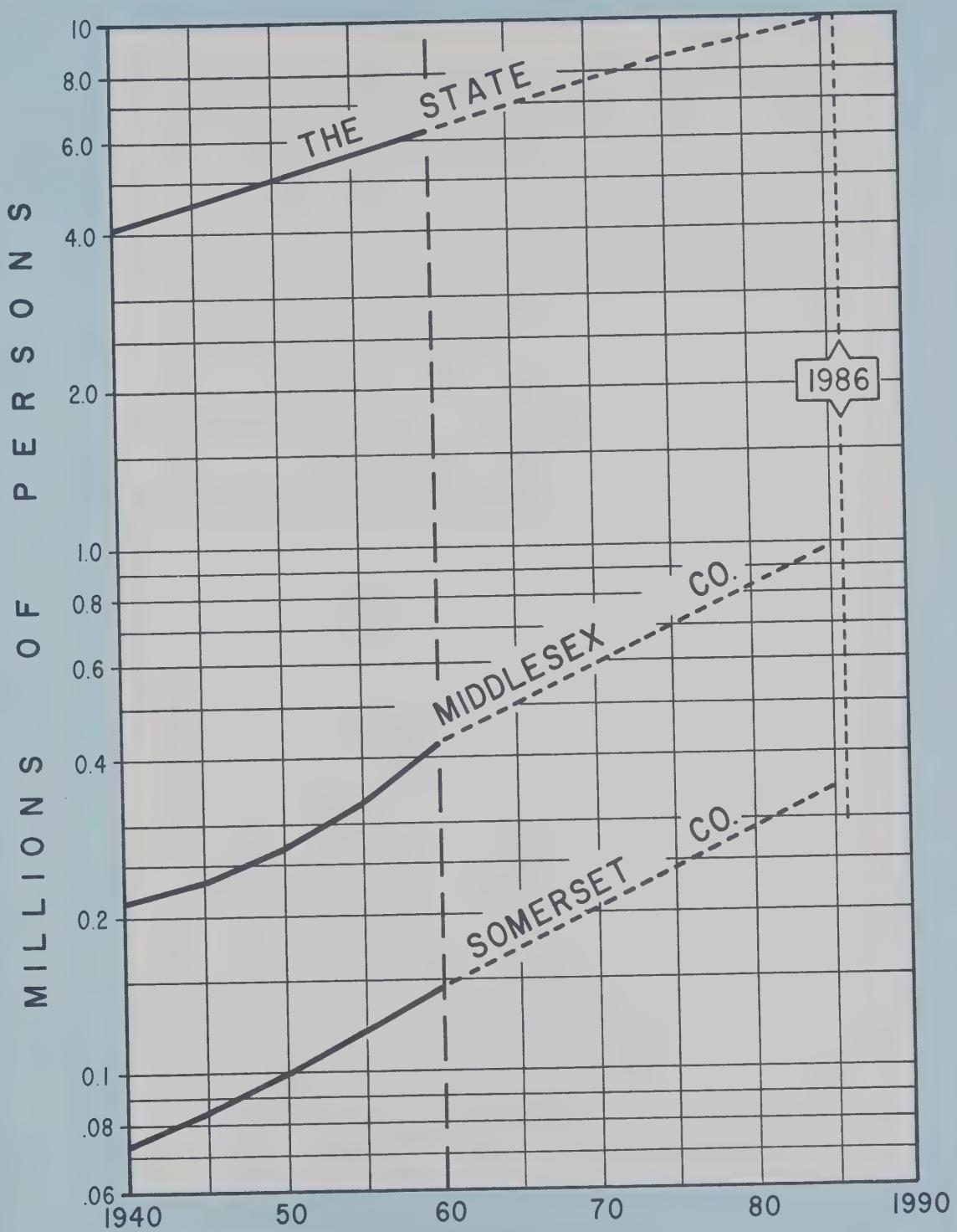
ESTIMATED POPULATION GROWTH OF NEW JERSEY COUNTIES  
1968 and 1986

<u>COUNTY</u>	<u>POPULATION</u>		<u>CHANGE 1960-1968</u>		<u>POPULATION 1986(3)</u>
	<u>1960(1)</u>	<u>1968(2)</u>	<u>Number</u>	<u>Per Cent</u>	
Atlantic	160,880	182,000	21,120	13.1	240,000
Bergen	780,255	1,042,700	262,445	33.6	1,200,000
Burlington	224,499	280,000	55,501	24.7	460,000
Camden	392,035	450,500	58,465	14.9	620,000
Cape May	48,555	55,510	6,955	14.3	75,000
Cumberland	106,850	123,250	16,400	15.3	170,000
Essex	923,545	959,000	35,455	3.8	1,000,000
Gloucester	134,840	172,500	37,660	27.9	300,000
Hudson	610,734	599,500	-11,234	-1.8	575,000
Hunterdon	54,107	67,315	13,208	24.4	110,000
Mercer	266,392	297,200	30,808	11.6	380,000
Middlesex	433,856	561,100	127,244	29.3	1,000,000
Monmouth	334,401	436,500	102,099	30.5	850,000
Morris	261,620	354,300	92,680	35.4	700,000
Ocean	108,241	151,900	43,659	40.3	325,000
Passaic	406,618	458,400	51,782	12.7	600,000
Salem	58,711	66,970	8,259	14.1	90,000
Somerset	143,913	189,200	45,287	31.5	350,000
Sussex	49,225	65,810	16,555	33.6	120,000
Union	504,255	557,850	53,595	10.6	700,000
Warren	63,220	74,980	11,760	18.6	110,000
TOTAL	6,066,782	7,114,772	1,047,990	17.3	9,975,000

(1) 1960 Census of Population, Characteristics of Population, Part 32, New Jersey, U.S. Department of Commerce, Bureau of the Census.

(2) Wilbur Smith and Associates.

(3) Highway Transportation in New Jersey, Wilbur Smith and Associates, 1968.



**POPULATION PROJECTIONS**  
**STATE OF NEW JERSEY**  
**AND**  
**MIDDLESEX AND SOMERSET COUNTIES**  
**1960-1986**

*Wilbur Smith and Associates*

FIGURE 2-1



From 1950 to 1965, population in Middlesex County increased by 270,000 persons, or 101.9 per cent, and in Somerset by 75,000, or 75.8 per cent. Projections for the 20 years, 1965 to 1985, show a slowing growth in Middlesex County with an increment of 300,000 persons (56.1 per cent). In Somerset County, it is expected that population will increase by 161,000 (92.5 per cent.)

#### Residential Growth Patterns

In conjunction with population projections, the Tri-State Transportation Commission projected a general residential pattern which gives an insight into the source and capabilities of future land use in the study area.<sup>(2)</sup> Total land area for the two counties remains static with fixed boundaries. An inventory of vacant land acreage in 1965 showed that Middlesex County had 54.0 per cent of its total area vacant, and Somerset had 72.1 per cent. It was estimated that 44 per cent of the reported vacant acreage would be available for residential development in each county.

In 1965, there were 3.5 persons per household on the average for the two counties. By applying the average number of persons per household to various densities, the amount of land needed under each density assumption can be estimated. Table 2-4 shows the vacant

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(2) Ibid.

Table 2-4

REQUIRED ACREAGE FOR RESIDENTIAL DEVELOPMENT  
UNDER ASSUMED DENSITIES

Middlesex and Somerset Counties  
New Jersey  
1965

<u>AREA</u>	<u>LOW DENSITY (1)</u>	<u>MEDIUM DENSITY (2)</u>	<u>HIGH DENSITY (3)</u>
Middlesex County	2,374	42,727	2,374
Somerset County	46,750	14,960	623

(1) Low density = 0.5 dwelling units per acre.

(2) Medium density = 2.0 dwelling units per acre.

(3) High density = 17.0 dwelling units per acre.

SOURCE: Tri-State Transportation Commission, Interim Technical Report: 4016-1735,  
Population and Employment in the Tri-State Region, 1940-1985, April 16,  
1965.

acreage required for residential development under the selected densities. The outcome for future residential land use in 1986 is favorable. With only 57.6 per cent of Middlesex's capacity and 46.8 per cent of Somerset's capacity utilized in 1965, there is ample room remaining in the counties for future growth and absorption of burgeoning population from other areas of New Jersey. In Table 2-5, projections of the two counties for 1985 can be evaluated.

The propensity of the population to move into vacant, developable land in the study area is evidenced in Table 2-6. The acreage of land in agricultural use is given for the years 1959 and 1964. In this relatively short period, 5,000 acres of Middlesex County and 9,000 acres of Somerset were diverted to other land uses. The statewide diversion totaled 223,000 acres.

Increasing population in the area and consequent upsurge in suburban residential living intensifies the need for improved transportation facilities. Initially, highways affect the direction in which suburban areas develop and afterwards continue to be a cause and effect of further development as accessibility is a major factor in choosing a residence.

Individuals depend on highway travel for all phases of living--as a means of traveling to and from home for work, shopping,

Table 2-5  
ESTIMATED POPULATION HOLDING CAPACITY

Middlesex and Somerset Counties  
New Jersey

<u>AREA</u>	<u>MAXIMUM NUMBER OF HOUSING UNITS</u>	<u>ESTIMATED POPULATION 1965</u>	<u>MAXIMUM POPULATION CAPACITY</u>	<u>1965 PER CENT OF MAXIMUM CAPACITY</u>
Middlesex County	126,999	535,000	928,697	57.6
Somerset County	63,886	174,000	372,047	46.8

SOURCE: Tri-State Transportation Commission, Interim Technical Report: 4016-1735,  
Population and Employment in the Tri-State Region, 1940-1985, April 16,  
1965.

Table 2-6

## AGRICULTURAL LAND USE

Middlesex and Somerset Counties  
 New Jersey  
 1959 and 1964

	NUMBER OF FARMS		TOTAL ACREAGE IN FARMS		PER CENT OF AREA IN FARM LAND		PERCENTAGE DECREASE 1959-1964
	1959	1964	1959	1964	1959	1964	
Middlesex	593	388	43,000	38,000	21.4	19.0	13.2
Somerset	608	471	65,000	54,000	33.2	27.5	20.4
New Jersey	15,459	10,641	1,379,000	1,156,000	28.6	24.1	19.2

SOURCE: County and City Data Book, 1967 (a statistical abstract supplement), U.S. Bureau of the Census, U.S. Government Printing Office, Washington, D. C., 1967.

and recreation. Table 2-7 shows increases in automobile ownership in the two counties for the years 1959 to 1964. Middlesex County experienced a 20 per cent increase in automobile ownership and Somerset, 18.5 per cent. In 1964, there were 2.8 persons per vehicle in Middlesex County and 3.0 in Somerset. For the state, the density of ownership ratio was 2.7.

Table 2-8 shows that the automobile has been used much more intensely in Middlesex and Somerset counties than in the state as a whole since 87.5 per cent and 89.5 per cent, respectively, of total workers depended on the automobile for transportation to and from work. The proportion relying on automobiles was substantial in all counties, and the average for the state was 76.4 per cent.

#### Migration

Net migration into New Jersey accounted for 46.9 per cent of the total population increase of 1,231,453 during the 10 years, 1950 to 1960. As shown in Table 2-9, the migration for all age groups was 10.2 per cent--highest rates were for the 25-35 year age group. This age group generally contains the persons of family formation age who are viable members of their society's activities.

Table 2-7

COMPARISON OF  
REGISTERED PASSENGER CARS AND POPULATION

Middlesex and Somerset Counties  
New Jersey  
1959 and 1964

<u>AREA</u>	<u>PASSENGER CARS REGISTERED</u>		<u>PER CENT CHANGE</u>	<u>PERSONS PER VEHICLE</u> <u>1964</u>	<u>POPULATION 1964</u>
	<u>1959</u>	<u>1964</u>			
Middlesex County	144,567	180,693	20.0	2.8	498,490
Somerset County	46,370	56,880	18.5	3.0	170,680
STATE	2,031,936	2,419,215	16.0	2.7	6,602,540

2-13

SOURCE: New Jersey Autolists Incorporated, Trenton, New Jersey; and Research and Statistics Section, Department of Conservation and Economic Development.

Table 2-8

MODE OF TRANSPORTATION TO WORK  
BY NUMBER OF WORKERSMiddlesex and Somerset Counties  
New Jersey  
1960

<u>AREA</u>	<u>PRIVATE AUTOMOBILE OR CARPOOL (number)</u>	<u>PER CENT</u>	<u>RAILROAD, ELEVATED, OR SUBWAY (number)</u>	<u>PER CENT</u>	<u>BUS (number)</u>	<u>PER CENT</u>	<u>TOTAL WORKERS<sup>(1)</sup> (number)</u>
Middlesex County	115,892	87.5	5,617	4.3	10,866	8.2	132,375
Somerset County	40,966	89.5	2,574	5.6	2,250	4.9	45,790
STATE	1,430,694	76.4	93,162	5.0	348,278	18.6	1,872,134

(1) Total workers category does not include the census categories of "other transportation, (1.8 per cent); walked to work, (9.1 per cent); worked at home, (4.0 per cent); and means of transportation not reported, (5.1 per cent)."

SOURCE: 1960 Census of Population, Characteristics of Population, Part 32, New Jersey,  
U. S. Department of Commerce, Bureau of the Census.

Table 2-9

## NET MIGRATION RATES OF THE POPULATION

Selected Counties  
 New Jersey  
 1950 - 1960

<u>AREA</u>	<u>NET MIGRATION 1950-1960</u>		<u>CHANGE IN POPULATION</u>		<u>MIGRATION/POPULATION 1950-1960 (per cent)</u>
	<u>Total</u>	<u>Rate</u>	<u>Number</u>	<u>Per Cent</u>	
THE STATE	577,431	10.5	1,231,453	25.5	46.9
Essex County	-121,771	-14.1	24,313	1.9	-14.3
Hudson County	-107,476	-15.9	-36,697	-5.7	-5.2
Middlesex County	108,237	35.1	168,984	63.8	64.1
Morris County	68,556	35.5	97,249	59.2	70.5
Somerset County	27,371	23.5	44,861	45.3	61.0
Union County	43,021	10.2	106,117	26.7	40.5

2-15  
 SOURCE: Net Migration of the Population, 1950-1960 by Age, Sex, and Color, Volume 1,  
part 1, Economic Research Service, U.S. Department of Agriculture.

Essex and Hudson counties had negative migration rates of -14.1 and -15.9 per cent, respectively, for the decade. Persons moved out of these highly urbanized counties into neighboring counties. Migration was distributed about equally among all age groups.

Bordering these counties are Morris and Union counties which experienced migration rates of 35.5 and 10.2 per cent, respectively, for the decade. For Morris County, net migration accounted for 70.5 per cent of the total population increase, and for Union County, 40.5 per cent. Morris County recorded substantial migration rates for all age groups up to age 54. In Union County, a -5.0 per cent rate of migration in the 20-24 age group was more than offset by a 28 per cent rate for the 30-39 age group.

Migrants moved into Middlesex and Somerset counties at the rate of 35.1 and 23.5 per cent, respectively. Middlesex's migration rate was positive in all age groups until age 59. Somerset's migration was concentrated in the age groups 25-50 and 1-14.

Interaction and interrelation of socioeconomic forces have shaped these population shifts in northeastern New Jersey. Hudson and Essex counties have participated in the New York

market for many years. By 1960, they were approaching physical stagnation. Essex County's population showed a slight increase of 1.9 per cent for 1950-1960, and Hudson County, a decrease of 5.7 per cent. In 1960, Hudson County was completely urbanized and Essex County was 99.7 per cent urban. Persons have necessarily left this environment and located in less densely populated areas. Persons, when moving, consider opportunities for employment and pleasant living. Their movement has formed a viable labor market from which industry can draw. And, a large consumer market which, in turn, supports new industry.

### Employment

Table 2-10 shows employment for 1960 and 1966 by industry group for Essex, Hudson, Middlesex, Morris, Somerset, and Union counties. These six counties may be considered as a geographical region which is characterized by socioeconomic shifts. The shifts are physical as population and employment have been moving westward for the last 15 to 20 years.

Essex and Hudson counties, nearest to metropolitan New York City, had lower percentage increases in employment, 6.9 and 9.9, respectively, than did the other four counties. These relatively small increases are overshadowed by the magnitude of increases in employment in Morris and Union counties, which abut Essex and Hudson on the west.

Table 2-10

## EMPLOYMENT DISTRIBUTION BY MAJOR INDUSTRY GROUP

Selected Counties  
New Jersey  
December, 1960 and 1966

<u>AREA</u>	<u>MANU- FACTURING</u>	<u>WHOLESALE AND RETAIL</u>	<u>TRANSPOR- TATION (number employed)</u>	<u>COMMUNICATIONS AND UTILITIES</u>
<b>Essex County</b>				
1960	129,176	73,372	15,971	14,127
1966	127,133	73,867	24,538	13,951
Number Change	-2,043	495	8,566	-176
Per Cent Change	-1.6	0.7	53.6	-1.2
<b>Hudson County</b>				
1960	110,668	31,399	21,452	4,008
1966	119,126	34,441	25,353	3,569
Number Change	8,458	3,042	3,901	-438
Per Cent Change	7.6	9.7	18.2	-9.2
<b>Middlesex County</b>				
1960	65,798	22,335	4,470	2,592
1966	87,273	29,897	5,574	2,999
Number Change	21,475	7,562	1,104	407
Per Cent Change	32.6	33.9	24.7	15.7
<b>Morris County</b>				
1960	22,141	11,027	874	2,001
1966	34,364	15,900	1,470	2,832
Number Change	2,223	4,873	596	831
Per Cent Change	55.2	44.2	68.2	41.5
<b>Somerset County</b>				
1960	18,174	5,513	719	480
1966	21,480	9,431	657	507
Number Change	3,306	3,918	-62	27
Per Cent Change	18.2	71.1	-8.6	5.6
<b>Union County</b>				
1960	83,154	33,925	3,611	4,299
1966	95,977	46,713	5,388	7,664
Number Change	12,823	12,788	1,777	3,365
Per Cent Change	15.4	37.7	49.2	78.3

Table 2-10 (Cont'd.)

<u>AREA</u>	<u>SMALL SERVICES AND AMUSEMENTS</u>	<u>FINANCE, INSURANCE, AND REAL ESTATE</u>	<u>CONSTRUCTION CONTRACTING</u> (number employed)	<u>MINING, AGRICUL- TURE AND OTHER</u>	<u>TOTAL</u>
<u>Essex County</u>					
1960	30,690	28,575	11,607	252	303,770
1966	37,616	31,209	16,085	465	324,864
Number Change	6,926	2,634	4,478	213	21,094
Per Cent Change	22.6	9.2	38.6	84.5	6.9
<u>Hudson County</u>					
1960	11,128	4,882	3,665	81	187,283
1966	13,461	4,424	5,337	85	205,796
Number Change	2,333	-458	1,672	4	18,513
Per Cent Change	21.0	-9.4	45.6	4.9	9.9
<u>Middlesex County</u>					
1960	4,161	1,659	5,797	688	107,500
1966	8,647	3,177	6,452	898	144,917
Number Change	4,486	1,518	655	210	37,417
Per Cent Change	107.8	91.5	11.3	30.5	34.8
<u>Morris County</u>					
1960	8,525	1,299	2,759	898	49,524
1966	10,013	1,290	3,284	626	69,779
Number Change	1,488	-9	525	-272	20,255
Per Cent Change	17.5	-0.7	19.0	-91.5	40.9
<u>Somerset County</u>					
1960	2,716	538	1,584	504	30,228
1966	2,247	838	2,659	488	38,307
Number Change	-469	300	1,075	-16	8,079
Per Cent Change	-17.3	55.8	67.9	-3.2	26.7
<u>Union County</u>					
1960	15,804	5,475	7,749	387	154,404
1966	18,505	6,599	9,597	821	191,264
Number Change	2,701	1,124	1,848	434	36,860
Per Cent Change	17.1	20.5	23.8	112.1	23.9

SOURCE: New Jersey Department of Labor and Industry, 1966.

Morris County experienced a 40.9 per cent increase in total employment from 1960 to 1966. For the same period, Union had a 23.9 per cent increase. Industries which had substantial increases (40 to 60 per cent) in Morris County were trade, transportation, and communications. The industries are vital to and indicative of a prospering economic structure. Union County experienced increases in all industries. Of particular interest are increases in trade, 37.7 per cent; transportation, 49.2 per cent; communications, 78.3 per cent; and construction, 23.8 per cent.

Middlesex County lies next to these counties and has been influenced by them. Between 1960 and 1966, the county experienced a 34.8 per cent increase in total industrial employment. All industries enjoyed increases in employment. Manufacturing and trade increased by about 33 per cent each. Small services increased by over 100 per cent and finance, insurance and real estate by 91.5 per cent.

Somerset County, located west of Middlesex, had a 26.7 per cent increase in employment. A 55.8 per cent increase in finance, insurance, and real estate and a 67.9 per cent increase in construction indicate more services for the rapidly growing population.

A review of the percentage distribution of industrial employment by counties in the region for 1960 and 1966 revealed that there were no relevant changes in distribution during the period, but proportionate growth occurred in all industries. The economy of this region is based on manufacturing (approximately 40 per cent) and trade (over 16 per cent) in every county.

#### Zoning and the Environment for Development

The purpose of zoning is to ensure that the land uses of a municipality meet certain minimum criteria with regard to the nature of use, location, size of development, density of development, and to control the level of development to the extent that it can be adequately serviced by the necessary governmental facilities.

Within each municipality, zoning is probably the most influential legal control available in the implementation of the land-use plan. The municipalities within the I-287, I-95 corridor have actively utilized their zoning powers in an effort to develop a sound planning program and a strong economic base while maintaining the amenities of a pleasant environment. A zoning ordinance's purpose is well defined by Article II of the Bridgewater Township zoning ordinance which reads as follows:

"The ordinance is enacted for the following purposes: to promote the health, morals, and general welfare of the inhabitants of the Township of Bridgewater, to lessen congestion in the streets; secure safety from fire, panic and other dangers; provide adequate light and air, prevent the surrounding of land or buildings; avoid undue concentration of population; and to conserve the value of property and encourage the most appropriate use of land."

Prior to the awareness of I-287's location, zoning as influenced by the existing transportation system was largely a function of that system. Industrial zones were established in the areas of railroad sidings and existing major highways. Commercial zones were either in clusters easily accessible to population concentrations or strips along the right-of-way of existing arterials. Residential zoning generally covered the remaining area.

With the development and construction of I-287, the municipalities which it traversed recognized the opportunity to enhance their industrial base by encouraging the industrialization of the I-287, I-95 corridor. Most of the zoning amendments which caused these changes were approved in the

early 1960's.(3) As a result, about 85 per cent of the area abutting I-287 is zoned for industrial use and except in South Plainfield Borough and part of Bridgewater Township where heavy industrial uses are allowed, industrial zones are restricted to limited industrial uses as shown in Figure 2-2.

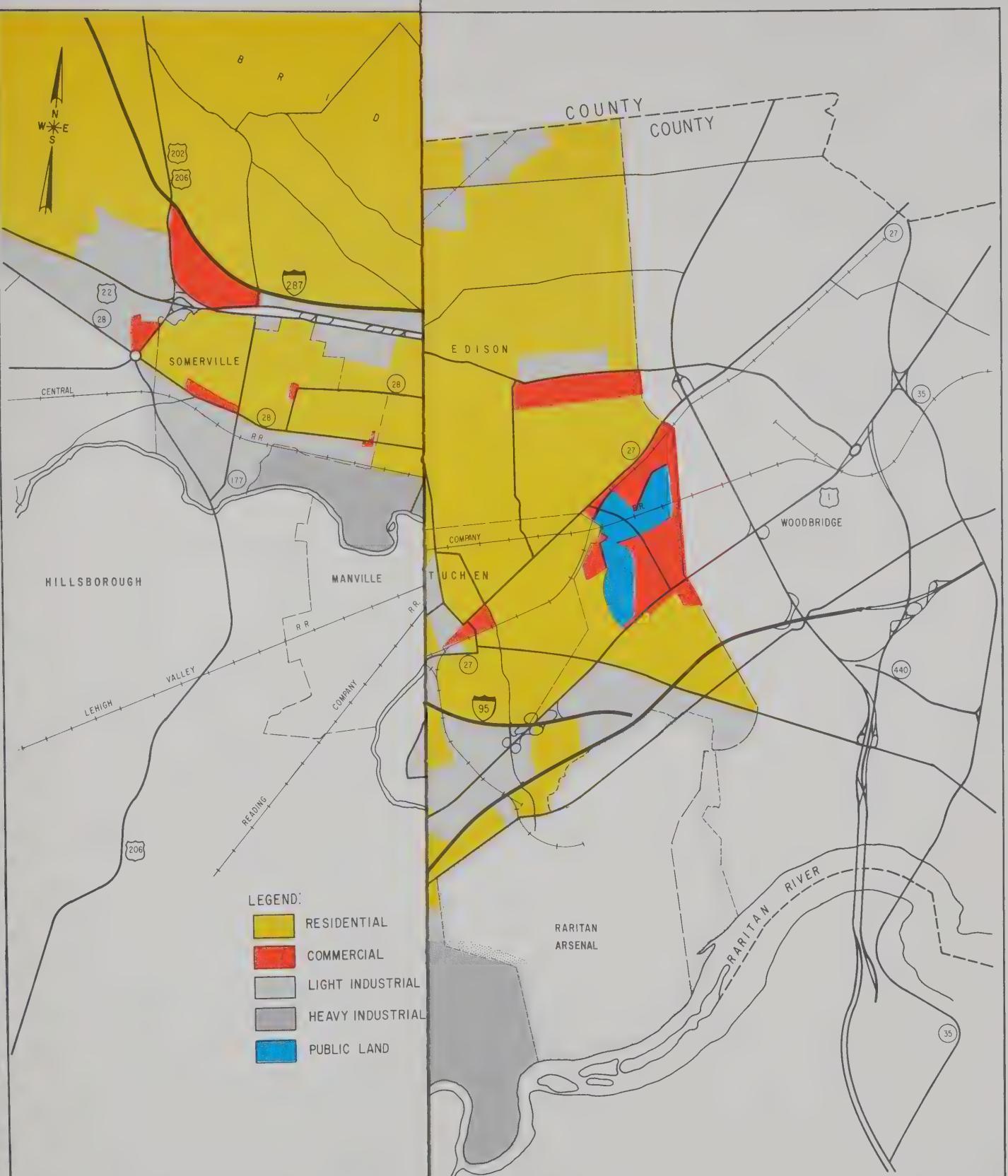
Commercial and other zones usually respond to demands for this type of use and as long as these zoning change requests conform to required standards and to the purpose of the general community plan they will usually be approved.

This then is the environment which has influenced the impact which I-287 has had on the areas it traverses. As will be shown, much of this impact particularly in the areas immediately adjacent to the highway has been industrial development. Impact has occurred because of a combination of several forces. Industry and population have been expanding at a rapid rate and as this growth occurs, new locations are being sought. I-287 is a high-capacity, limited-access facility which could in effect channel much of this activity to relatively undeveloped

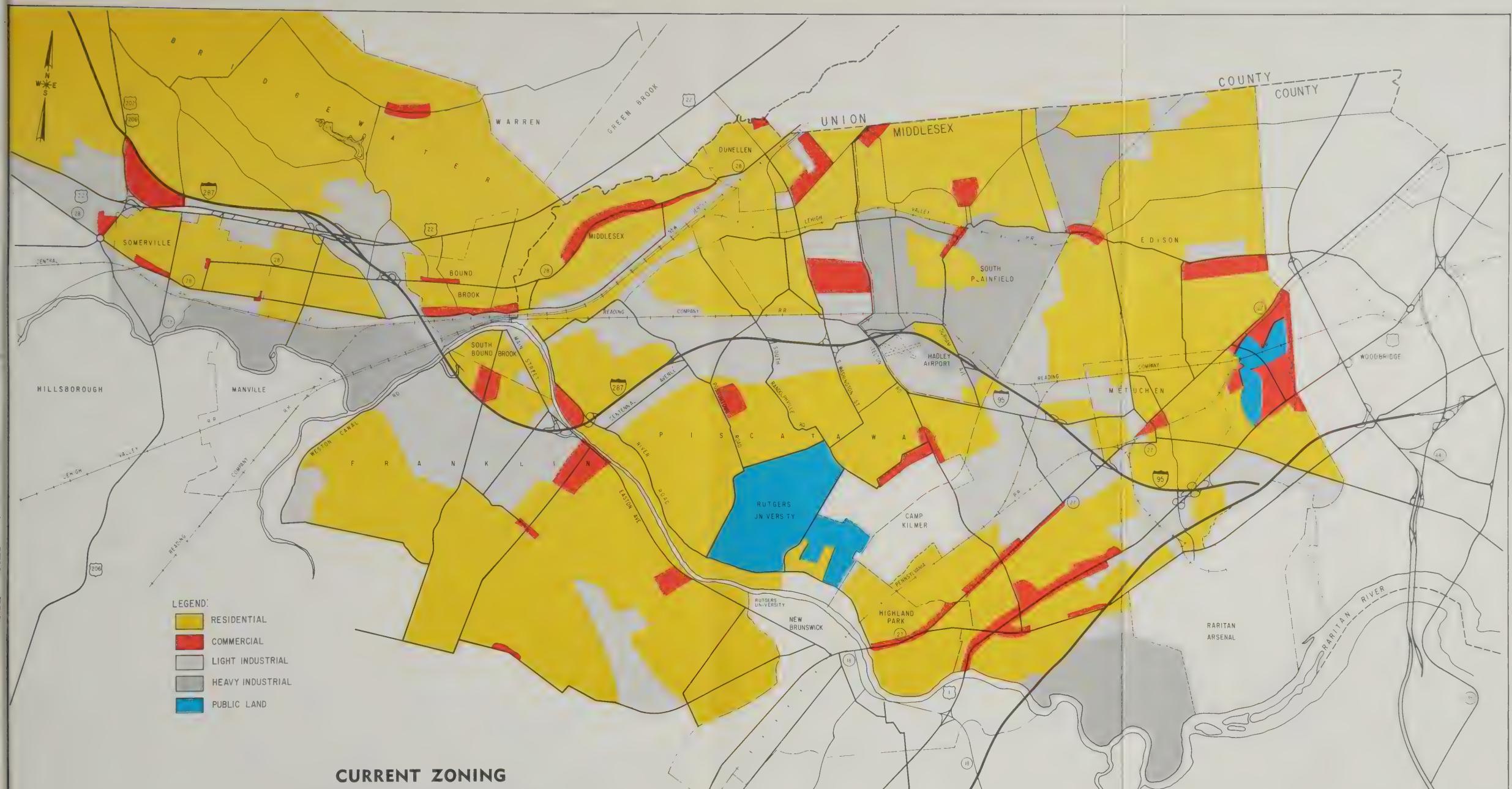
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(3) For a detailed understanding of zoning changes and when they occurred in these communities, their respective zoning ordinances should be consulted.

areas. Desiring industrial and residential development, the communities along I-287 have made several necessary adjustments to encourage development. Some of the results of these actions are investigated and analyzed in the following chapters.



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## Chapter 3

### INDUSTRY MANAGEMENT INTERVIEWS

The purpose of this chapter is to indicate the effect of Interstate Highway 287 on the development and operational characteristics of industrial firms situated in proximity to the highway. Included are firms engaged in manufacturing, distribution, research and development, retail and wholesale trade, and transportation.

#### Selection of Interviewed Establishments

The intensive study of the effect on I-287 on industrial activity was concentrated in an area extending 1 mile from each side of the right-of-way and up to 3 miles at interchanges. Such a limitation restricted the ability to structure a sampling procedure based on employment size or standard industrial classification for the entire study area.

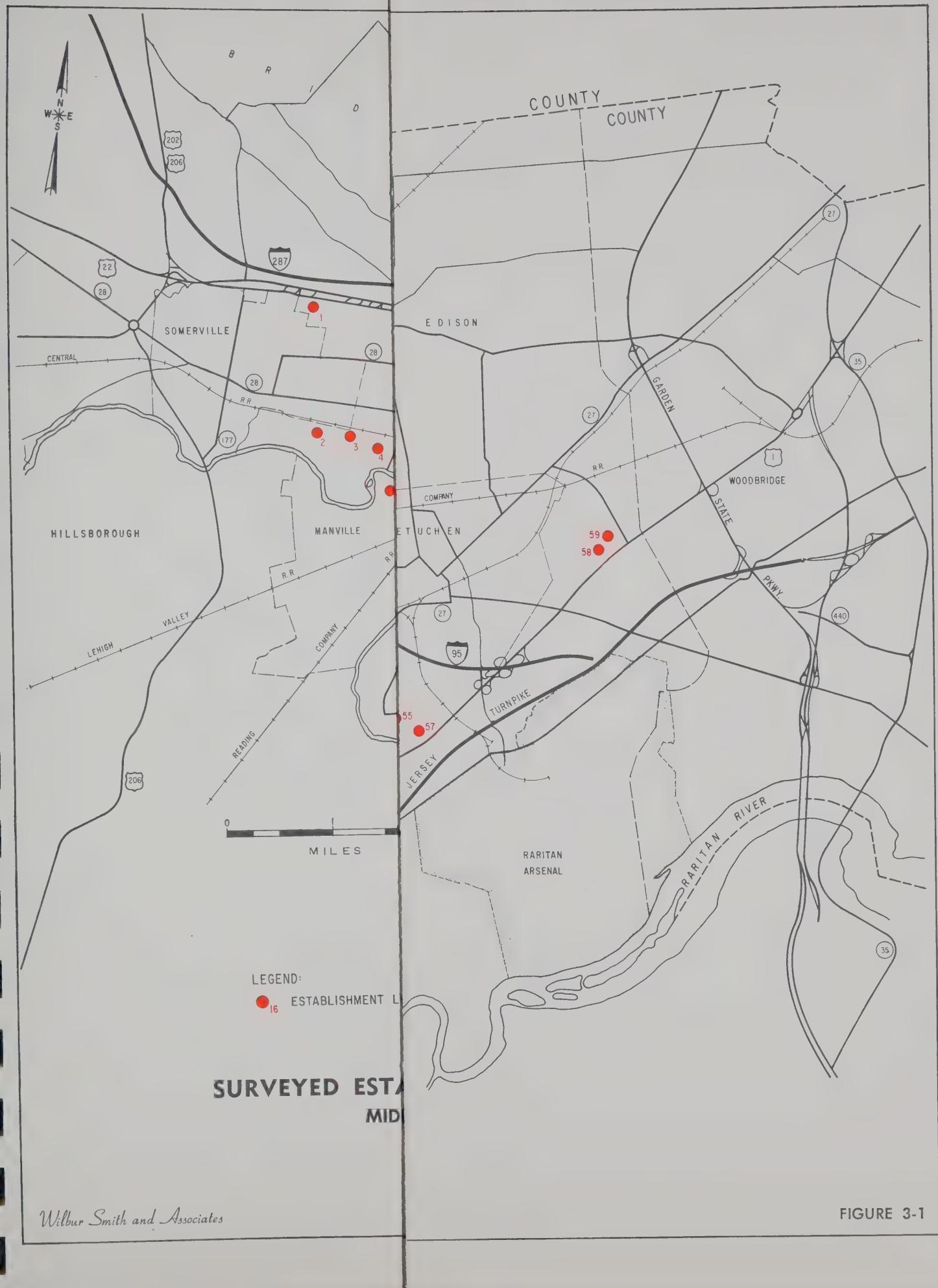
The selection of establishments was based on the Industrial Directory 1967 published by the Middlesex County Industrial Department and the Industrial Directory sponsored by the Board of Chosen Freeholders of Somerset County. In addition, the Industrial Development Coordinator in Somerset County and the Industrial Commissioner of Middlesex County were asked to supply the names and addresses of new firms which had located after the

directories have been published. Using street maps, a list of all those industries located within the distance criteria was prepared. Each of these industries was contacted on a priority basis depending on its location with reference to I-287. Those industries adjacent to the highway were contacted first. Interviews were conducted with a total of 59 firms. The following tabulation shows the distribution of interviewed firms by type of activity.

<u>TYPE OF ACTIVITY</u>	<u>NUMBER INTERVIEWED</u>
Manufacturing	32
Distribution and Trade	13
Research and Development	7
Transportation	<u>7</u>
TOTAL	59

#### Interview Form

A single interview form was developed for industrial and commercial establishments. The form consisted of several pages and was designed to permit analysis of each firm's characteristics in terms of Interstate location and use. In an investigation such as this, it is difficult to get direct answers, particularly to questions such as the extent to which a specific highway influenced site location. The typical interviewee was unable to sort out the relative significance of each of the many interrelated factors

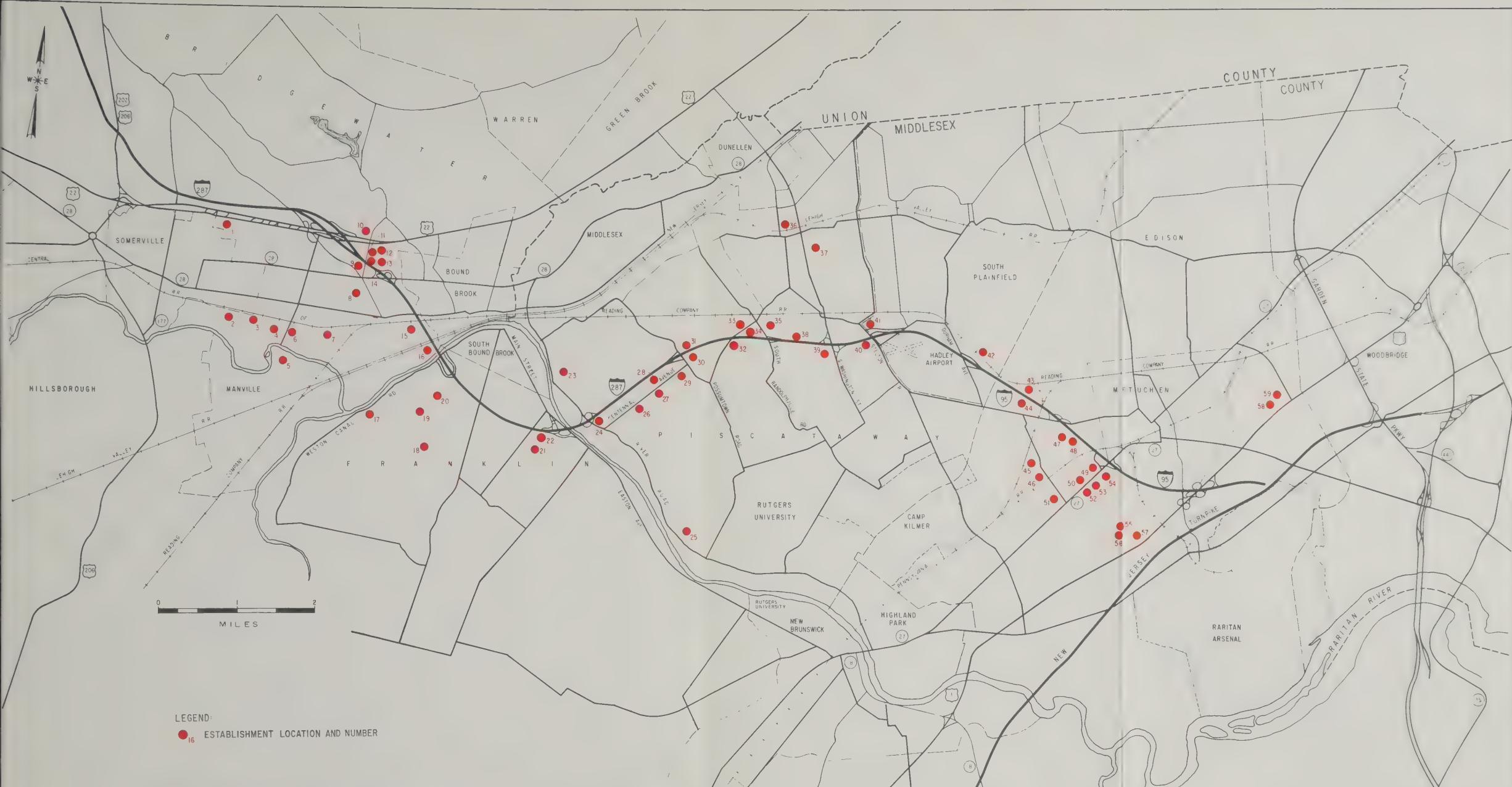


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**SURVEYED ESTABLISHMENTS – I-287, I-95 CORRIDOR**  
**MIDDLESEX AND SOMERSET COUNTIES**  
**NEW JERSEY**  
**1967**



involved. In these cases, the staff sought a clear understanding of the characteristics of each firm so that responses could be properly interpreted. This information was also required as complementary material for the evaluation and analysis of the employee questionnaires. A detailed description of the interview form and a list of participating firms are included in Appendix A.

#### Results of Interviews

Where possible, the replies to questions on the interview form were summarized and tabulated. Included in the discussion and analysis of the tabulations are those interviewee comments which help clarify or qualify meaning. This is necessary because certain areas of questioning instigated rather lengthy responses.

Figure 3-1 shows the location of interviewed firms. Identifying establishment numbers are coordinated with the list of participating firms found in Appendix A.

Impact on Site Selection- Each interviewee, whose establishment had located at its present site since 1960, was asked to list the primary factors determining the selection of his establishment's current site. The year 1960 was chosen since it is very doubtful that I-287 could have influenced any location decisions prior to that date. Some interviewees gave multiple

responses, but only the three most significant factors cited by each interviewee are included in Table 3-1. The principal reasons in rank order were:

1. Proximity to I-287
2. Availability of large land parcels
3. Price of land, and
4. Accessibility of customers

These four reasons accounted for 64.0 per cent of the responses. The second and third reasons, accounting for 32.6 per cent of the responses, may be partially related to accessibility and an increase in the supply of undeveloped land available. The fourth, accounting for 10.1 per cent of the responses, is indicative of the multifactor process of site selection which must also consider accessibility not only to customers but also to management, labor, materials, and the various services needed to maintain the viable character of a functioning firm. Access in this sense does not necessarily imply direct access to I-287 which can be accomplished through one or more of the 13 interchanges within the study area. Rather, access is used in the sense of regional access which I-287 affords through other regional highways in the study area.

These data, while indicative, are not indisputable evidence of I-287 impact since, particularly in Middlesex and Somerset counties, highways capable of accommodating industrial development have long been in existence. To be more specific,

Table 3-1

PRIMARY REASONS FOR SELECTION OF PRESENT SITE  
BY GENERAL INDUSTRY GROUP  
1960 - 1967

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey

<u>REASON</u>	<u>GENERAL INDUSTRY GROUP</u>				<u>TOTAL</u>	<u>PER CENT</u>
	<u>Manufacturing</u>	<u>Distribution and Trade</u>	<u>Research and Development</u>	<u>Transportation</u>		
Proximity to I-287	9	6	1	3	19	21.3
Availability of Large Land						
Parcel	13	2	-	-	15	16.9
Price of Land	11	2	1	-	14	15.7
Accessibility of Customers	2	3	-	4	9	10.1
Proximity to Other Modes	2	1	-	3	6	6.7
Greater Market Coverage	1	3	-	1	5	5.6
Personal Reasons	1	1	3	-	5	5.6
Near Metropolitan Area	1	1	1	-	3	3.4
Near Home of Founder	3	-	-	-	3	3.4
Low Taxes	3	-	-	-	3	3.4
Near a University	-	-	2	-	2	2.3
Availability of Building	2	-	-	-	2	2.3
Study Recommendation	-	1	-	-	1	1.1
Accessibility of Labor	-	-	1	-	1	1.1
Business Services Provided	-	1	-	-	1	1.1
<b>TOTAL</b>	<b>48</b>	<b>21</b>	<b>9</b>	<b>11</b>	<b>89</b>	<b>100.0</b>

SOURCE: In response to the question: "Why was your present site chosen?"

all firms regardless of time of location were asked, "was knowledge of the route of I-287 a significant factor in site selection?" Table 3-2 shows the results by year of location. The highway did not become a significant site selection factor until the last period, 1961-1967, the period in which the highway was constructed and opened to traffic. In this period, 25 firms found this highway factor significant while 7 did not. Since I-287 is not yet completed or connected with other long-distance sections of the Interstate System, many firms explained the significance of I-287 as a thruway to such long-haul routes as U.S. 22, 202, and 206 to the west; and U.S. 1, the New Jersey Turnpike, and Garden State Parkway to the east, north, and south. These firms also recognized the value of their locations in terms of accessibility upon completion of the system. Accessibility in terms of travel time to corporate headquarters and the markets of New York and Philadelphia was cited as a reason for I-287's significance in their location criteria.

From the action of these firms, it would appear that the disadvantages of limited accessibility to I-287 are considered secondary to the more important regional access provided by the highway.

Of the seven managers who did not consider I-287 a major factor, five represented manufacturing concerns and two, research

Table 3-2

SIGNIFICANCE OF I-287, I-95 CORRIDOR AS A SITE SELECTION FACTOR  
BY YEAR LOCATED AND INDUSTRY GROUP

Middlesex and Somerset Counties  
New Jersey  
1967

INDUSTRY GROUP	PRIOR TO 1956		1956 - 1960		1961 - 1967		TOTAL	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
<b>Manufacturing</b>								
Yes	0	0.0	1	20.0	12	70.6	13	40.6
No	10	100.0	4	80.0	5	29.4	19	59.4
<b>Distribution and Trade</b>								
Yes	0	0.0	0	0.0	7	100.0	7	53.8
No	3	100.0	3	100.0	0	0.0	6	46.2
<b>Research and Development</b>								
Yes	0	0.0	0	0.0	2	50.0	2	28.6
No	2	100.0	1	100.0	2	50.0	5	71.4
<b>Transportation</b>								
Yes	0	0.0	0	0.0	4	100.0	4	57.1
No	3	100.0	0	0.0	0	0.0	3	42.9
<b>TOTAL</b>								
Yes	0	0.0	1	11.1	25	78.1	26	44.1
No	18	100.0	8	88.9	7	21.9	33	55.9

SOURCE: In response to the question: "Was knowledge of the route of I-287, I-95 Corridor a significant factor in site selection?"

and development firms. The five manufacturers considered other factors more important or considered their locations temporary and chosen for expediency. The two research and development firms desired to have sites in proximity to Rutgers University, and an Interstate location was not required for business purposes.

One firm, with distribution as its primary function, had a study make in 1965 to determine the optimum location for its facility. The study showed that several locations in suburban New Jersey would be the most economical of the alternate sites considered.<sup>(1)</sup> Of the 20 sites considered, 17 had primary access to I-287.

Employment- One of the most important questions raised in impact studies concerned with site decisions is the effect on employment. If industry is moving into an area, employment is going to increase. Although detailed analyses of what happens to the area being settled by industry, and the net effect on regional employment are beyond the scope of this study, the responses to three questions asked of each interviewee provide some answers.<sup>(2)</sup>

- (1) It was agreed that the identity of the firm would be confidential.
- (2) The three questions: "What was the address of your previous location? What was the approximate total number of employees at your previous establishment? What is the number of employees on each shift?"

Table 3-3 shows the number of persons employed by establishments which have relocated since 1960 and whether I-287 was a significant site selection factor. Total firm employment increased 12.9 per cent, or 502 persons, over previous location employment. This increase would have been higher if one large research and development firm had not reduced the number of employees by 200 consequent to relocation and changed a policy involving the nature of the research orientation of the firm. Excluding this firm from the sample, employment would have increased 24.5 per cent, or a net increase of 702 persons.

When a firm changes location, it usually does not relocate all its employees. The normal company policy is to relocate top management personnel and in some cases the better craftsmen, depending on skill availability. A similar pattern was followed by those industries relocating near the I-287, I-95 corridor. The effect on the employment structure of the former location, however, is less significant than might have been expected since many of the relocating industries are still within automobile commuting distance of former sites. Table 3-4 is a list of the former sites of interviewed industries which have relocated near I-287.

Both the period prior to 1960 and that from 1960 to 1967 show similar relocation origins with the primary orientation to

Table 3-3

NUMBER EMPLOYED BEFORE AND AFTER RELOCATION BY SIGNIFICANCE OF I-287  
AS A SITE SELECTION FACTOR BY TYPE OF INDUSTRY LOCATING SINCE 1960

Middlesex and Somerset Counties  
New Jersey

1967

TYPE OF INDUSTRY	I-287, I-95 SIGNIFICANT FACTOR				I-287, I-95 NOT SIGNIFICANT FACTOR			
	Employment		Change		Employment		Change	
	Previous	Current	Number	Per Cent	Previous	Current	Number	Per Cent
Manufacturing	1,180	1,583	403	34.2	307	365	58	18.9
Distribution and Trade	665	786	121	18.2	50	50	0	0.0
Research and Development	140	200	60	42.9	1,025	800	-225	-22.0
Transportation	146	231	85	58.2	0	0	0	0.0
TOTAL	2,131	2,800	669	31.6	1,382	1,215	-167	-12.1

NOTE: Includes those firms which had relocated, i.e., those firms for which a prior employment figure was available. The current employment totals for all firms locating since 1960 are: I-287, I-95 was significant, Manufacturing, 1,734; Distribution and Trade, 861; Research and Development, 500; Transportation, 167; I-287, I-95 was not significant, Manufacturing, 740; Distribution and Trade, 0; Research and Development, 800; Transportation, 0.

Table 3-4

FORMER LOCATIONS OF INDUSTRIES  
NOW LOCATED WITHIN THE I-287, I-95 CORRIDOR

Middlesex and Somerset Counties  
New Jersey

1967

<u>TIME OF RELOCATION</u>	<u>FORMER LOCATION</u>	<u>NUMBER OF FIRMS</u>
Prior to 1960	Pennsylvania	1
	Hillside, N. J.	1
	New Brunswick and Plainfield, N. J.	1
	Bound Brook, N. J.	2
	Jersey City, N. J.	1
	Long Island City, N. Y.	1
	Brooklyn and Bronx, N. Y.	1
	Plainfield, N. J.	1
	Union, N. J.	1
	Newark, N. J.	1
	Somerville, N. J.	1
	Perth Amboy, N. J. and Chicago, Ill.	<u>1</u>
	TOTAL	13
1960 to 1967	Jersey City, N. J.	4
	Union, N. J.	5
	South Plainfield, N. J.	1
	Pennsylvania and Union, N. J.	1
	Elizabeth and East Brunswick, N. J.	1
	Edison, N. J.	1
	Brooklyn, N. Y.	1
	Metuchen, N. J.	2
	Newark, N. J.	2
	Minnesota and New York	1
	Bayonne, N. J.	1
	New York City, N. Y.	2
	Long Island City, N. Y.	1
	Somerville, N. J.	1
	Plainfield, N. J.	1
	Trenton, N. J.	1
	Bound Brook, N. J.	1
	Highland Park, N. J.	1
	North Plainfield, N. J.	<u>1</u>
	TOTAL	29

the dense and congested northeast conurbation. The significant point is that not only are industries relocating to this area at an increasing rate, but that industries are moving from locations in the same region.

Table 3-5 further documents the character of the firms moving into the area. Since 1960, 7 firms have established branches, 16 firms have relocated branches in the area, and 13 firms have re-located entire operations.

The branch operations established since 1960 have added a total of 917 jobs. Of these, 542 were in firms considering I-287 a significant location factor and 375 in firms that did not.

Industries relocating in the same region are occupying newer, larger, and better equipped facilities employing more persons and new branch establishments are being created. Therefore, the impact on the employment structure of the region may generally be regarded as contributing to the economic growth of the regional as well as local community.

Effect of I-287 on Company Employees- A series of questions was asked of each interviewee concerning what effect I-287 has had with regard to employee procurement, noticeable employee commuting problems, and adequacy of location with regard to their labor market. Indicative responses to these questions were often

Table 3-5  
 RELOCATION CHARACTERISTICS BY TYPE OF INDUSTRY  
 I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

TYPE OF INDUSTRY AND RELOCATION PERIOD	RELOCATION CHARACTERISTICS				<u>TOTAL</u>
	New Branch	Relocated Branch	Relocated Firm	First Location	
Manufacturing					
Prior to 1960	4	4	2	3	13
1960-1967	5	3	11	0	19
Distribution and Trade					
Prior to 1960	1	2	1	0	4
1960-1967	1	7	1	0	9
Research and Development					
Prior to 1960	1	2	0	0	3
1960-1967	0	4	0	0	4
Transportation					
Prior to 1960	1	0	2	0	3
1960-1967	1	2	1	0	4
Summary					
Prior to 1960	7	8	5	3	23
1960-1967	<u>7</u>	<u>16</u>	<u>13</u>	<u>0</u>	<u>36</u>
<b>TOTAL</b>	<b>14</b>	<b>24</b>	<b>18</b>	<b>3</b>	<b>59</b>

difficult to extract either because of a lack of information or because many managers were more interested in the simple supply and price structure of the labor market without serious regard to origin, access, or commuting problems.

It is interesting to note the distribution of those responses to the question on employee commuting which are summarized in Table 3-6. Research and development firms, as a category, place little emphasis on the highway location criterion but seem to be very conscious of improvements in employee accessibility. This may be attributed in part to the notorious independence of research oriented personnel as well as their sensitivity to environment which may often require a residence well removed from place of work. Also, since research and development firms draw from a market with limited availability of required skills, ease of accessibility to place of employment can be an important factor to a successful personnel program. It is also for this reason that many such firms place proximity to a major university high on the list of criteria, since this may be a good source of qualified personnel as well as a selling point to prospective employees.

Manufacturing, distribution and trade, and transportation firms generally noticed less change due largely to an established labor market. The manufacturing firms which did notice a change may be characterized as those: (1) operating on a seasonal

Table 3-6

EFFECT OF I-287, I-95 ON EMPLOYEE COMMUTING CHARACTERISTICS  
AND POTENTIAL LABOR MARKET

Middlesex and Somerset Counties  
New Jersey

1967

TYPE OF INDUSTRY	COMMUTING CHARACTERISTICS				POTENTIAL LABOR MARKET					
	Improved		No Change		Improved Or Expanded		No Change		Response Not Applicable	
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
Manufacturing	17	65.4	9	34.6	11	39.3	12	42.8	5	17.9
Distribution and Trade	4	66.7	2	33.3	6	85.7	0	0.0	1	14.3
Research and Development	6	85.7	1	14.3	4	47.1	0	0.0	3	42.9
Transportation	2	50.0	2	50.0	1	20.0	1	20.0	3	60.0
TOTAL <sup>(1)</sup>	29	67.5	14	32.5	22	46.7	13	27.7	12	25.6

(1) Totals do not add to 57 firms because many firms had located since I-287 was constructed and the managers did not feel qualified to respond objectively; some had not considered the question before and did not know and several felt more qualified to give some answer to the labor market question than the question on commuting characteristics.

SOURCE: In response to the question: "What have you found the effects to be from locating on I-287, I-95 on employee procurement insofar as (a) commuting problems of employees? (b) the change in the potential labor market with respect to quantity and quality?"

employment cycle, (2) not well established, (3) requiring more personnel than available prior to I-287, and (4) requiring certain limited availability skills. For these firms, I-287 had the effect of expanding their labor market particularly into the Edison, New Brunswick, and Somerville areas.

Changes in the potential labor market which could be attributable to the influence of I-287 was a question more suitable for qualification than quantification. An attempt at quantification is shown in Table 3-6, with over 25 per cent of the responses not directly quantifiable. Similar responses were elicited to the following question: "Do you think that your present location is well situated with regard to your labor market?" It is significant that over 46 per cent of those responding indicated that their potential labor market had improved or expanded. If only those whose response could be quantified are considered, this percentage exceeds 60 per cent. The qualitative response recorded in all but two cases related to a tight labor supply due primarily to one or a combination of the following factors: (1) new industries' demand exceeds supply, (2) lack of public transportation, (3) dearth of required skills, (4) tough wage competition for labor and employee piracy, and (5) lack of unskilled labor. As additional new industry locates in the area, the competition for labor will increase. The impact

of this situation on population, housing, and continued improvement in ground transportation systems is obvious.

In conclusion, it may be stated that I-287 has generally improved commuting conditions and has, therefore, generally expanded the potential labor market. The labor market on the other hand has not been able to react quickly enough to meet industry demand.

Investment- The data requested regarding investment in land, buildings, and equipment were among the most difficult for the various interviewees to provide. Many managers either did not know or did not feel at liberty to divulge this information. Although about 14 firm managers were able to supply some or all of this data, an effort was made to complete the sample. This process usually involved contacting someone in the head office having access to this information and often required supplemental actions before these data could be released. The actions involved were: (1) the company's legal department would have to be consulted by the contact, (2) a letter assuring the company of the nature of the study, and (3) confidentiality of presentation was required of the Project Director. Because of time limitations, little additional data were obtained.

The price paid for land, and acreages per firm are shown in Table 3-7. These data provide a good indication of

Table 3-7

## LAND INVESTMENT AND ACREAGES BY INDUSTRY TYPE

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey

1967

<u>TYPE OF INDUSTRY</u>	<u>NUMBER OF FIRMS</u>	<u>TOTAL ACRES</u>	<u>AVERAGE</u>	<u>TOTAL PRICE PAID</u>	<u>AVERAGE</u>	
			<u>ACRES PER FIRM</u>		<u>Price Paid Per Acre</u>	<u>Price Paid Per Firm</u>
Manufacturing	9	273	30.3	\$1,931,000	\$7,073	\$214,555
Distribution and Trade	5	57	11.4	538,126	9,441	107,625
Research and Development	2	185	92.5	789,000	4,265	394,500
Transportation	<u>3</u>	<u>23</u>	7.7	<u>185,000</u>	8,433	61,667
<b>TOTAL (1)</b>	<b>19</b>	<b>538</b>	<b>28.3</b>	<b>\$3,443,126</b>	<b>\$6,400</b>	<b>\$180,691</b>

(1) In all but two cases these data represent firms which have located between 1960-1967. The two other firms located in the 1950's and have little effect on the above averages.

SOURCE: In response to the question: "What is the company's approximate investment in land?"

the recent land investment characteristics of firms locating in the study area. It is characteristic of research and development firms to purchase large acreages to ensure control of the immediate environment, provide room for expansion, adequate parking, and in some cases, for investment purposes.

Manufacturing firms have the second greatest investment in land with an average of \$214,555 per firm. These firms purchase lots with excellent accessibility, usually in view of the highway and require that the lot exceed 30 acres and be adequate for efficient plant layout. The site must be convenient for access to labor, transport, and to customers. These are all factors which limit availability and affect price. Manufacturing firms paid an average of \$7,073 per acre.

Transportation or trucking firms generally move with the market or concurrent with industrial development. Their site requirements include high accessibility both to customers and transport facilities. As a result, many of these firms locate in well developed or developing areas on relatively small, high-cost lots.

Distribution and trade firms are interesting in that they tend to pay the highest price per acre for their locations. This may be due partly to their location criteria which usually require that locations have excellent accessibility within their market

framework. Since those areas which meet these criteria are usually prime locations, the laws of land economics dictate that the price be higher than less accessible locations.

In summary, research and development firms generally purchase the largest lots and have the greatest per firm investment in land while distribution and trade establishments purchase smaller higher-priced lots. Manufacturing firms also tend to have a large investment per firm in relatively expensive acreage while transport firms tend to have the lowest per firm investment in small lots of slightly more expensive land.

Change in Land Values- A general rule of land economics is that land value is a function of the return that land can realize and that this return is a function of the use capacity of that land. Use capacity or the most efficient utilization a particular lot of land is capable of sustaining is closely related to three factors--access, location within the spatial distribution of the region's economic activity, and the dynamic character of the region's economic activity. Naturally, this assumes that all land is physically the same and that no governmental policy encouraging development or restraining it is in force. A brief study of the characteristics of the areas being developed near I-287 will aid in the explanation of changes in land values that have occurred in this corridor.

Local governmental policy is probably of primary importance since municipalities through zoning, taxation, permit, and public utility policies can effectively control or encourage certain types of development. This is not to deny the importance of the access provided by I-287, but the highway can do little more than provide access to an area. From then on, the forces of society and economics assume leading roles.

Municipal governments along the I-287, I-95 corridor recognized in this highway an opportunity to expand their industrial tax base and enhance their industrial economy. Accordingly, most of the vacant land abutting or in proximity to the highway was zoned either limited or heavy industrial. Notable examples of this include Piscataway Township and the Borough of South Plainfield.<sup>(3)</sup>

Since these municipalities recognize that zoning is not a panacea to industrial development, efforts have been made to improve connecting highways and to provide public utilities, sewer, and water which are so important to industry. Piscataway's Centennial Avenue industrial complex, the home of five new industries since 1960, is a good example of municipal industrial encouragement. The point of this is that good usable industrial sites were made available for industry at the initiative of the municipalities. Interstate Highways

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(3) Refer to the zoning ordinances of the Township of Piscataway and the Borough of South Plainfield for graphic examples of industrial zoning adjacent to Interstate right-of-way.

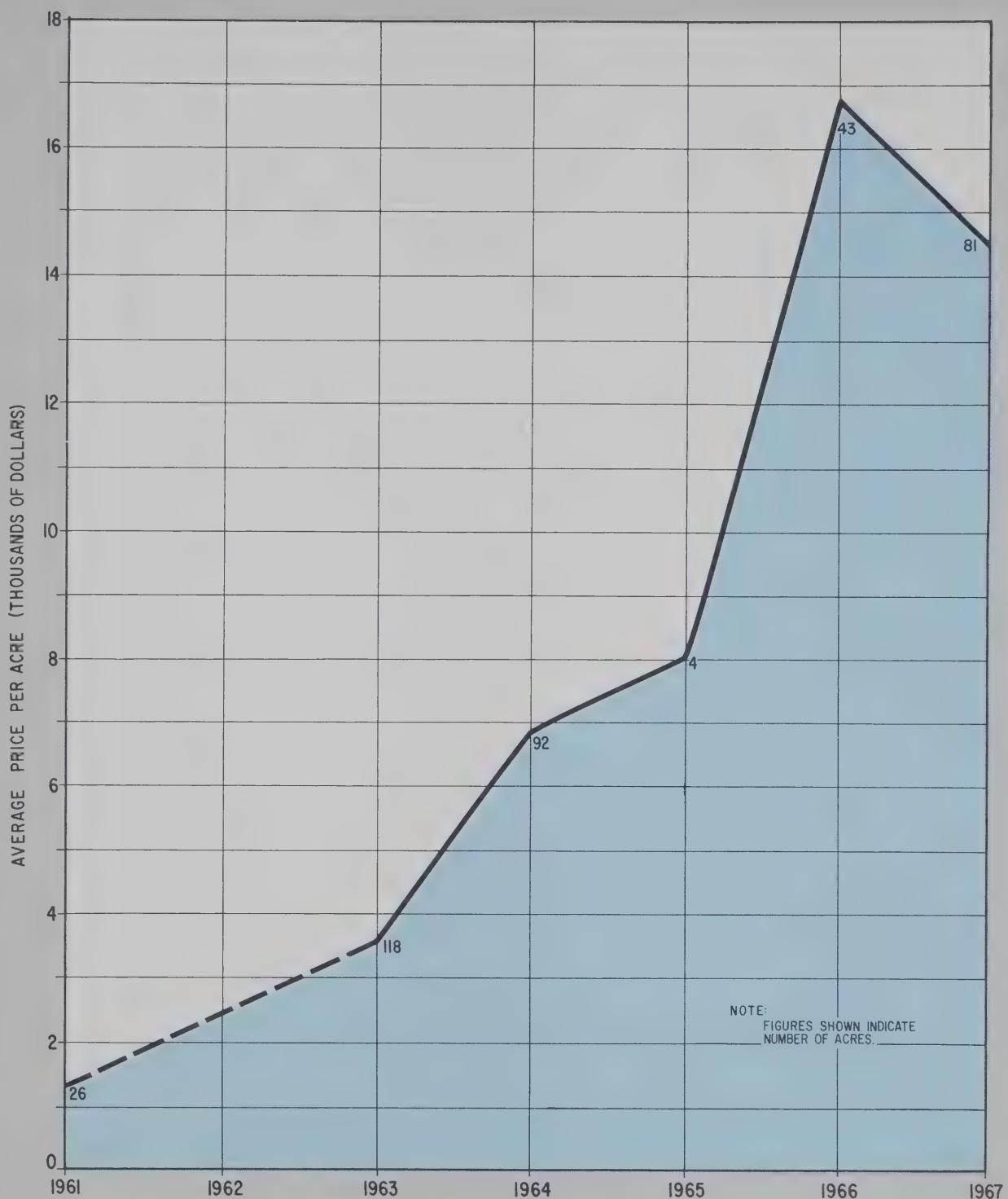
287 and 95 introduced excellent access to areas in one of the region's fastest growing and most rapidly industrializing areas. Thus, a favorable location within an economically dynamic area was assured these properties. One other general law of economics comes into play at this point. As demand for a fixed supply increases, price tends to also increase.<sup>(4)</sup> Therefore, as an area develops, the prime sites tend to be developed first and the price of the remaining prime sites increases.<sup>(5)</sup>

The data on land investment gathered through the management interviews are indicative of this process. Figure 3-2 shows the prices paid per acre by those firms which have located in the I-287, I-95 corridor between 1961-1967 with one exception. There were no land investment data for those firms which located in 1962. During this period, price per acre increased at an average annual rate of 73.2 per cent. The 12.8 per cent decline in price per acre in 1967 may be explained in part by the characteristics of those interviewed firms which located in this period. Two firms may be seen from the highway but neither of these have direct access to the highway through a full interchange. Only one firm enjoys both

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(4) By fixed supply is meant those few areas providing the optimum combination of those factors considered important to industry in site location decisions.

(5) Another force is also at work. Industries tend to follow one another into an area, thus as an area becomes attractive to more industries, land owners and brokers may artificially inflate prices since the industrial site market is willing to bear the cost.



**AVERAGE PRICE PAID PER ACRE FOR INDUSTRIAL SITES  
I-287, I-95 CORRIDOR  
MIDDLESEX AND SOMERSET COUNTIES  
NEW JERSEY  
1961-1967**



of these advantages. The other two firms cannot be seen from the highway and in terms of accessibility are well removed from the corridor. Thus, it would appear that accessibility and visibility can also be important factors to the value of industrial land.

It may be concluded that there are many factors affecting land values including government policy, accessibility, supply of sites meeting certain criteria, visibility, and demand. In the I-287, I-95 corridor, prices have tended to increase at an annual rate of 73.2 per cent. However, in the last year, 1967, prices declined 12.8 per cent as less advantageous sites were developed. As new industries develop and more sites become suitable and are developed, prices should continue to increase.

Investment in Plant and Equipment- Almost every plant manager interviewed was quite sensitive for various reasons about divulging information on the company's investment in buildings and equipment. Building investments of firms for which these data were available are presented in Table 3-8. While the number of firms is few, the data are probably indicative of the magnitudes of investment for the various types of industry locating in the I-287, I-95 corridor.

Table 3-8

SIZE OF BUILDING AND INVESTMENT IN BUILDING  
BY TYPE OF INDUSTRY

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>TYPE OF INDUSTRY</u>	<u>NUMBER OF FIRMS</u>	<u>TOTAL BUILDING INVESTMENT</u>	<u>TOTAL SQUARE FOOTAGE</u>	<u>AVERAGE</u>		<u>INVESTMENT PER SQUARE FOOT</u>
				<u>Building Investment</u>	<u>Square Footage</u>	
Manufacturing	4	\$ 5,800,000	473,000	\$1,450,000	118,250	\$12.26
Distribution and Trade	3	1,550,000	122,500	516,667	40,833	12.65
Research and Development	2	7,300,000	350,000	3,650,000	175,000	20.86
Transportation	(1)	(1)	(1)	(1)	(1)	13.60
<b>TOTAL</b>	<b>9</b>	<b>\$14,650,000</b>	<b>945,500</b>	<b>\$1,627,778</b>	<b>105,056</b>	<b>\$15.49</b>

(1) Withheld to avoid disclosure of confidential information.

SOURCE: Response to the question: "What is this company's approximate investment in buildings?  
Square footage of buildings?"

Research and development firms tend to have the most expensive buildings on a price per square foot basis. This is probably due to the very comfortable suite-type arrangements these buildings often assume as well as special building requirements often necessary for research operations. Manufacturing, distribution and trade, and transportation firms seem to have a reasonably consistent cost per square foot building investment of \$12 to \$14. Manufacturing firms generally have the largest buildings while transportation firms, the smallest.

Applying these average values to the numbers of firms, excluding transportation firms, which have located near I-287 since 1960, a very rough estimate of the total building investment is generated. The values are \$27,550,000 for manufacturing firms, \$4,650,000 for distribution and trade firms, and \$14,800,000 for research and development firms for an estimated total of \$46,800,000. If these averages are applied to firms locating since 1960, which considered I-287 a significant location factor, the following values are generated: \$17,400,000 for manufacturing firms; \$3,617,000 for distribution and trade firms; and \$7,300,000 for research and development firms. This yields an estimated total investment in buildings of \$28,317,000, and represents 60.5 per cent of the total building investment of all firms locating since 1960.

Very few firm managers were able to supply data on equipment investment due largely to the mobility of such supplies, the various depreciation methods used, and a basic difficulty of differentiating between equipment, inventory, and necessary supplies. Suffice it to say that manufacturing firms generally had the largest equipment investments per plant, research and development firms the next highest, and transportation firms generally the lowest. Distribution and trade firms generally had sizable investments in inventory.

Raw Materials and Goods Transport - Each interviewee was asked a series of questions concerning the effect of I-287 on goods transport operations. For those firms which had located prior to the opening of this highway to U.S. Route 1 in July, 1963, questions were pointed toward changes that occurred in either speed, route, or methods of transport. Also asked were questions designed to ascertain the characteristics of each firm's goods movement operations.

Rail Facilities - There are four possible methods of transporting raw materials and finished goods--rail, highway, air, and water. For firms in the I-287, I-95 corridor, air and water can be eliminated because both types of facilities are enough removed to require either rail or highway transport to or from terminals at Elizabeth, Newark, or New York.

The character of firms in the study area and their transportation requirements have changed in recent years. When year of plant location is related to existence of a siding, as shown in Table 3-9, it is apparent that the dependence of suburban firms on rail transport is small and getting smaller. Less than one third of the manufacturing plants which located between 1961 and 1967 had a rail siding, the lowest proportion in any time period. Similar patterns exist for distribution and trade, and research and development firms. All of the transportation firms interviewed were primarily in the trucking business and while they might perform transfer functions between rail facilities and plants, none had rail sidings. Table 3-9 shows that in each successive time period the requirement of firms for adjacent rail facilities has become less pronounced. There are several apparent reasons for this. All eight of the manufacturing firms which located prior to 1950 are involved in primary manufacturing which involves the processing of great quantities of raw materials or large-scale assembly operations which would probably require rail facilities as a primary means of bulk transport. The firms which have located since 1950 have generally been of a different character involving products of less bulk and higher value much of which can be transported most easily and efficiently by truck.

Table 3-9

## EXISTENCE OF RAIL SIDING RELATED TO PERIOD LOCATED

I-287, I-95 Corridor

Middlesex and Somerset Counties  
New Jersey

1967

<u>TYPE OF INDUSTRY</u>	<u>TIME PERIOD</u>					<u>TOTAL</u>
	Prior to 1940	1940-1950	1950-1955	1956-1960	1961-1967	
<b>Manufacturing</b>						
Number of Firms	5	3	2	5	17	32
Firms with Siding	5	3	1	3	5	17
Per Cent with Siding	100.0	100.0	50.0	60.0	29.4	53.1
<b>Distribution and Trade</b>						
Number of Firms	-	-	3	3	7	10
Firms with Siding	-	-	2	1	2	5
Per Cent with Siding	-	-	66.7	33.3	28.6	50.0
<b>Research and Development</b>						
Number of Firms	-	1	1	1	4	7
Number with Siding	-	0	1	0	1	2
Per Cent with Siding	-	0.0	100.0	0.0	25.0	28.6
<b>Transportation</b>						
Number of Firms	-	1	2	-	4	7
Number with Siding	-	0	0	-	0	0
Per Cent with Siding	-	0.0	0.0	-	0.0	0.0
<b>TOTAL</b>						
Number of Firms	5	5	8	9	32	59
Number with Siding	5	3	4	4	8	24
Per Cent with Siding	100.0	60.0	50.0	44.4	25.0	40.7

SOURCE: In response to the question: "Is there a rail siding?"

Change in Methods of Goods or Materials Transport - The Interstate Highway System upon completion in 1975 will be a high speed-limited access link to virtually every city of consequence in the conterminous United States. By virtue of this fact alone, it would appear that this system may be very influential in the transport mode decisions of firms whose transport time and cost requirements are important to the cost structure and operations of the firm. In an effort to determine the validity of this hypothesis, interviewees were asked if any change in mode of transport had occurred since I-287 was opened. This, of course, had to be directed at those firms that had rail sidings and used them. The responses did not yield any quantifiable results except for one research and development firm which had increased its truck shipments substantially. All other firms indicated that there had been little or no change, but several indicated that the mode mix would probably change as the Interstate System approaches completion.

Each interviewee was asked to provide some measure of the magnitude of current rail and truck shipments. The measure varied depending on the type of firm. Some managers thought in terms of tons, some in terms of car or truck loads, and some in terms of numbers of items. For comparison, these measures were converted to per cents which do not reveal frequency of shipments but do reveal an approximation to the firms' transportation mode mix.

Not surprisingly, distribution and trade firms tend to rely most heavily (15.7 per cent of all shipments) on rail transport for incoming goods as shown in Table 3-10. Research and development firms generally do little shipping on a scheduled basis, however, two firms in this category as part of their development process actually manufacture devices or materials on a small scale which they ship by rail in about 20 per cent of the cases. In total, there appears to be a consistent but low level of rail utilization by all firms.

Tables 3-11 and 3-12 present another view of the rail-truck mode mix used by firms in the I-287, I-95 corridor for the transport of raw materials and finished goods. Of all firms, 40, or 67.8 per cent, use truck transport exclusively for incoming raw materials or product inputs as seen in Table 3-11. No firms use rail transport exclusively for input transportation. One manufacturing firm and one research and development firm use rail to the extent of 80 and 90 per cent, respectively, for raw material transportation. Table 3-12 shows the same information for finished products. The results are quite similar except that fewer firms use any rail for finished goods transport. Of all firms, 43, or 72.9 per cent, use truck transport exclusively for finished goods transportation. Two fewer manufacturing firms and one fewer distribution and trade firms use rail for transport of finished goods than did for incoming goods or raw materials.

Table 3-10

## METHOD OF GOODS TRANSPORT BY TYPE OF INDUSTRY

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

<u>TYPE OF INDUSTRY</u>	METHOD OF GOODS TRANSPORT			
	Raw Materials		Finished Goods	
	Rail	Truck	Rail	Truck
	(per cent)		(per cent)	
Manufacturing	13.2	86.8	12.7	87.3
Distribution and Trade	15.7	84.3	14.3	85.7
Research and Development	14.3	85.7	20.0	80.0
Transportation	0.0	100.0	0.0	100.0
TOTAL (1)	14.1	85.9	14.2	85.8

(1) Total does not include transportation industries since these firms by definition of the sample are in the truck transport business.

SOURCE: In response to the question: "Since the opening of I-287 (I-95) what changes have occurred in your method of transporting your raw materials (stock goods) and finished goods (retail deliveries)?"

Table 3-11

NUMBER OF FIRMS BY LEVEL OF TRUCK  
UTILIZATION FOR MOVEMENT OF RAW MATERIALSI-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey

1967

PER CENT By Truck	By Rail	TYPE OF INDUSTRY				<u>TOTAL</u>
		Manufacturing	Distribution and Trade	Research and Development	Transportation	
		(number of firms)				
100	0	18	10	5	7	40
75-99	1-25	9	3	1	-	13
50-74	26-50	2	-	-	-	2
25-49	51-75	2	-	-	-	2
0-24	76-100	1	-	1	-	2
TOTAL		32	13	7	7	59

3-32

SOURCE: In response to the question: "Since the opening of I-287 (I-95) what changes have occurred in your method of transporting your raw materials (stock goods) and finished goods (retail deliveries)"?

Table 3-12

NUMBER OF FIRMS BY LEVEL  
OF TRUCK UTILIZATION FOR MOVEMENT OF FINISHED GOODS

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

	PER CENT		TYPE OF INDUSTRY				<u>TOTAL</u>
	<u>By Truck</u>	<u>By Rail</u>	<u>Manufacturing</u>	<u>Distribution and Trade</u> (number of firms)	<u>Research and Development</u>	<u>Transportation</u>	
100	0	20	11	5	7		43
75-99	1-25	7	2	-	-		9
50-74	26-50	2	-	1	-		3
25-49	51-75	2	-	-	-		2
0-24	76-100	<u>1</u>	<u>-</u>	<u>1</u>	<u>-</u>		<u>2</u>
TOTAL		32	13	7	7		59

SOURCE: In response to the question: "Since the opening of I-287 (I-95) what changes have occurred in your method of transporting your raw materials (stock goods) and finished goods (retail deliveries)"?

A number of conclusions and inferences can be drawn from these data. The availability of both rail and truck transport allows firms to use that mode of transport which best meets their cost and time requirements. No firms in this area are today dependent exclusively on railroads for the movement of inputs and finished products. The majority are dependent solely on truck transport for the movement of both categories of goods. This is particularly true for those firms which have located in the area since 1960. A major consideration of efficient truck utilization is the availability of high-speed highways with minimal grade such as that provided by I-287. The effect of I-287 on speed and efficiency of transport operations will be the subject of investigation of a later section.

Delivery Speed and Routing - Managers of those firms operating prior to 1963, the year I-287 opened to U.S. 1, were queried concerning truck routing changes and delivery speed changes due to changes in accessibility. Responses were limited to those interviewees whose firms owned and used their own trucks for pickups and deliveries or cases where the interviewee was intimately familiar with the operating characteristics of the contract or common carriers serving the plant. Results are shown in Table 3-13.

Table 3-13

CHANGE IN ROUTINGS, DELIVERY OR  
DISTRIBUTION SPEED FOR RESPONDING INDUSTRIES

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

TYPE OF INDUSTRY	ROUTING CHANGES				DELIVERY OR DISTRIBUTION SPEED CHANGES			
	Number		Per Cent		Number		Per Cent	
	Yes	No	Yes		Yes	No	Yes	
Manufacturing	11	3	78.6		12	4	75.0	
Distribution and Trade	3	1	75.0		3	1	75.0	
Research and Development	0	2	0.0		0	1	0.0	
Transportation	<u>3</u>	<u>0</u>	100.0		<u>3</u>	<u>0</u>	100.0	
TOTAL <sup>(1)</sup>	17	6	73.9		18	6	75.0	

(1) Totals represent those interviewees who could respond. Most transportation was done by contract or common carriers, thus requiring the interviewee to be intimately familiar with his carriers transport characteristics in order to reply.

SOURCE: In response to the question: "Have you made any changes in your routings of deliveries or pickups since the opening of I-287, I-95? Has I-287, I-95 caused any changes in the speed of delivery to this site?"

In every case, transportation firms indicated that they had changed routings whenever possible in order to take advantage not only of increased speed and efficiency but also the safety features this highway offers. Indeed, these firms were quite sensitive to the changes caused by this highway. The following comments made by these interviewees express the effect I-287 has had and will have on these companies.

"Use I-287 whenever possible."

"When I-287 is completed to the north, will use it much more--now use it primarily to get to U.S. 22."

"Interstates have speeded up delivery efficiency."

"Saves 15-20 minutes in getting to Somerville."

"Has cut travel time to Somerville in half."

"Saves 10 minutes driving time to Brooklyn."

"If used to go north, I-287 has speeded up delivery by 20 per cent. In reaching U.S. 22, it has increased safety more than speed because we can avoid Dunellen."

"I-287 has made it possible to maintain approximately 50 mph to and from delivery areas. Without it, 30 mph."

As a result, business, industry, and the consumer all benefit from the reduced costs and greater efficiencies realized by the transport companies.

The effect on transport companies has generally been recognized by manufacturing and distribution and trade establishments. Table 3-13 shows that 75 per cent or more of these firms had made routing changes which have resulted in increased delivery speeds or conversely reduced delivery times. Research and development firms were not as cognizant of the changes since the firms included here do very little material shipping. If the questionnaire had been oriented toward people movements or communications, research and development firms might have responded differently.

In summary, it may be concluded that the I-287, I-95 corridor although only partially completed has had a significant effect on delivery times, routings, and safety. It follows that this impact would be most significant to transportation firms although the effects have generally been recognized by manufacturing and distribution and trade firms. Little effect has been felt by the nongoods transporting research and development firms.

Truck Ownership and Use - Of all the firms participating in the interview, 32.2 per cent owned and operated trucks to perform at least a proportion of their shipping needs as shown in Table 3-14. With the exception of transportation firms, the largest percentage of truck-owning firms were in the distribution and trade category. One firm in the research and development group

Table 3-14

## TRUCK OWNERSHIP CHARACTERISTICS BY TYPE OF INDUSTRY

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

<u>TYPE OF INDUSTRY</u>	TRUCK OWNERSHIP			
	<u>Yes</u>	<u>Per Cent</u>	<u>No</u>	<u>Per Cent</u>
Manufacturing	7	21.9	25	78.1
Distribution and Trade	4	30.8	9	69.2
Research and Development	1	14.3	6	85.7
Transportation	7	100.0	0	0.0
TOTAL	19	32.2	40	67.8

owned a truck which was used for local trips to pick up supplies and deliver mail to the New Brunswick post office. Most firms having transport requirements used contract and/or common carriers to meet their needs.

The managers of those firms which owned their own trucks were asked how many trucks they owned, the annual mileage, and how much of the total mileage was performed on I-287. Only one manager was able to estimate this mileage, therefore, the response to a previous question on the effect of I-287 on routings was used as an indication of truck use of the facility by these firms.

Table 3-15 shows that six of the seven respondents who provided usable data used I-287 as part of their truck routings. It is interesting that these trucks generally covered longer distances annually than did nonuser trucks. As it was with the common carriers discussed previously, this probably indicates that those firms shipping long distances or to areas directly accessible from I-287 find the facility an asset particularly for its connections with other major routes at the present time. This hypothesis is supported by the characteristics of the one manufacturing firm which indicated nonuse of the highway. The plant was located west of the intersection of I-287 and U.S. 22. All shipping from the plant was to distribution centers to the west of its location. Therefore, it could probably be assumed that this firm would have utilized the highway if distribution points were located to the east.

Table 3-15

INTENSITY OF USE OR NONUSE OF I-287, I-95  
BY FIRMS OWNING AND OPERATING TRUCKS

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>USE OR NONUSE</u>	<u>NUMBER OF FIRMS</u>	<u>NUMBER OF TRUCKS</u>	<u>ANNUAL MILEAGE</u>	<u>TOTAL MILEAGE</u>
USE I-287, I-95	6	38	36,474	1,386,000
NONUSE OF I-287, I-95	<u>1</u>	<u>3</u>	33,333	<u>100,000</u>
TOTAL <sup>(1)</sup>	7	41	36,244	1,486,000

(1) Excludes transportation firms which use I-287 whenever possible.

SOURCE: In response to the question: "Do you use your own trucks for the pickup or delivery of raw materials, finished goods, products, or services? Yes, No. Number of trucks? Have you made any changes in your routings of deliveries or pickups since the opening of I-287, I-95?"

Expansion and Relocation Plans - In a viable growing economy, expansion, growth, and relocation are watchwords for business and industry. In the I-287, I-95 corridor, growth has been substantial, particularly during the influence period of I-287. Of the 59 establishment managers interviewed, 32 indicated that their firm had located during this period. If current trends continue, the I-287, I-95 corridor in Middlesex and Somerset counties will undoubtedly continue to be the site of new plant locations. An important part of the net industrial growth of this area will include the expansion or relocation plans for existing firms. A brief investigation was made of site adequacy, expansion plans, and relocation plans of those firms in the I-287, I-95 corridor which participated in the management interviews. These data yield some indications of the future character of the area.

When asked if their present site was adequate for their future needs, 47 interviewees, or 79.7 per cent, indicated that the site was adequate for the foreseeable future, as shown in Table 3-16. The foreseeable future for most firms was 5-10 years, yet 25 firms had expansion planned and 19 of these planned to expand at their present site. Seven firms managers who felt that their present site was not adequate indicated that no expansion was planned at present. Six indicated that expansion was planned but at another site. Therefore, it could be concluded that 19 firms whose present site was adequate

Table 3-16

**SITE ADEQUACY AND PLANNED EXPANSION LOCATION  
BY TYPE OF INDUSTRY**

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>TYPE OF INDUSTRY</u>	<u>SITE ADEQUATE</u>		<u>EXPANSION PLANNED</u>	<u>AT PRESENT SITE</u>	<u>AT ANOTHER</u>
	<u>Yes</u>	<u>No</u>			
Manufacturing	25	7	13	10	3
Distribution and Trade	10	3	7	5	2
Research and Development	6	1	4	3	1
Transportation	<u>6</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>
TOTAL	47	12	25	19	6

SOURCE: In response to the question: "Is your present site adequate for your future needs? Do you have plans for expansion? If yes, will expansion occur on your present site? Another? Or both?"

for expansion indeed planned to expand in the near future. Virtually all of the 19 plant managers who planned to expand at their present site pointed out that excess acreages or acreage options were purchased just for that purpose. Of the six firms planning to relocate, only one anticipated a location outside the Middlesex, Somerset area. This firm planned a Mid-West location which better suited its distribution function. These plans indicated that the I-287, I-95 corridor will experience substantial and continued growth just through the expansion of existing firms. Unfortunately, only two managers were able to reveal the exact timing and magnitude of their expansion plans. One firm planned an additional \$200,000 warehouse by 1969. The other firm indicated a \$2,500,000 building for 1969 and several additional buildings before 1975.

Most of the firms planning expansion or relocation moved to the area after 1950 and 75.0 per cent, or 18 of these 24 firms, located since 1960. This represents 54.5 per cent of the firms locating from 1960 to 1967. This statistic would tend to indicate that the firms which have recently located are fast growing concerns of the type which have made New Jersey an economically dynamic state. Of these 18 firms, the 15 which plan to expand at their present site all indicated that I-287 was a significant site selection factor. Three of the six firms planning to relocate did not although five of the six are considering sites in the region. These data are shown in Table 3-17.

It may be concluded then that I-287 is not only an important factor to externally sourced industrial growth but internally as well. Most firms which have located in the area have purchased or optioned adequate land for future expansion.

Table 3-17

SITE ADEQUACY AND PLANNED EXPANSION BY YEAR LOCATED

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

<u>YEAR LOCATED</u>	SITE <u>ADEQUATE</u>		<u>EXPANSION PLANNED</u>	<u>AT PRESENT SITE</u>	<u>AT ANOTHER</u>
	<u>Yes</u>	<u>No</u>			
Prior to 1940	4	1	0	-	0
1940-1949	5	0	1	1	-
1950-1955	3	4	3	-	3
1956-1960	7	2	3	3	-
1961-1967	<u>28</u>	<u>5</u>	<u>18</u>	<u>15</u>	<u>3</u>
TOTAL	47	12	25	19	6

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SOURCE: Responses to the questions: "When was your establishment opened at its present site? Is your present site adequate for your future needs? Do you have plans for expansion? Present site? Another? Or both?"

## Chapter 4

### IMPACT ON WORK TRIPS

The reasons for giving special attention to work trip characteristics are numerous. The work trip is the most important category of travel by urban oriented residents and accounts for about 40 per cent of all home-based trips in large urban regions. As the major contributor to peak-hour travel, it is the determinant of most urban traffic problems and a principal indicator of highway needs.

Highly desirable for a study of this type would have been answers to the following questions: Will the trip to work be made more convenient by I-287? If so, which areas of worker residence will benefit most? Can this convenience of travel, combined with the development of industry in the I-287, I-95 corridor, be related to a shift in employee residence patterns? Unfortunately, there have been no comprehensive origin and destination studies in the study area with which to compare the results of this survey. However, these data may be useful for comparison with later studies.

The objective of this investigation was to answer these and other questions with respect to work trips at places of employment along the I-287, I-95 corridor in Middlesex and Somerset counties. Basically a fact-finding investigation, the survey

reported here did not aim for a complete analysis of the impact of the facility on travel to work. A summary of findings and general conclusions which can be drawn at this time are included in the final section of this chapter.

#### Survey Procedure

Two alternative survey methods were available: A questionnaire at the place of work, or an interview or questionnaire at the place of residence. In this case, the choice was to administer a questionnaire at selected establishments in the corridor. Several valid considerations dictated this approach. Since this is a study of the impact of I-287, it was reasonable to assume that industries located in the corridor would be among the greatest beneficiaries as well as important traffic generators. By using this approach, the administration of the employee questionnaire could be handled concurrent with the management interview. Such a procedure would reveal the work trip characteristics of people working near the highway as well as the characteristics of those using and not using I-287. Although this procedure does raise sampling difficulties, it has the advantage of providing specific information for a limited area which in some cases may be related to areawide generalizations.

The employee questionnaire contained seven questions pertaining to work trip and employee characteristics. A description and copy of the questionnaire are included in Appendix B.

Although management interviews were conducted throughout the field work phase of the study, only those managers interviewed 3 weeks prior to the conclusion of the field work phase were asked to have their employees complete the questionnaire. Of the 45 firms asked to participate, 31 (68.9 per cent) agreed. The usual reasons given for not participating included: (1) the firm was at the peak of its seasonal production schedule, therefore no one was available to supervise the distribution and collection of the questionnaires; (2) the company was currently involved in employee contract negotiations and such a questionnaire program might represent a management liability; (3) some could not cooperate on directive from their main office; and (4) various other reasons.

Those firms participating were given enough questionnaires and cover letters to assure that each employee could be included.<sup>(1)</sup> Each firm was asked to have the distribution and collection completed within 2 weeks. A staff member then visited the firm to pick up the

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(1) A cover letter explaining the purpose of the survey and requesting cooperation signed by Commissioner David J. Goldberg, Department of Transportation, was attached to each questionnaire. A copy of this letter is included in Appendix B.

questionnaires and make arrangements to pick up any additional questionnaires which might be collected. In general, the response was adequate for analysis. Table 4-1 shows the number of sampled establishments by percentage return of the employee questionnaire. The percentage return varied from 3.6 to 93.3 and the return per firm averaged 39.8 per cent. A complete list of participating firms, their employment size, and per cent return of usable questionnaires is included in Appendix C.

Data Processing- Every completed questionnaire was coded according to the coding instruction included in Appendix D. The data were then keypunched and a contingency check made to determine which questionnaires were usable. In total, 3,964 questionnaires were usable of a total return of 4,219. Sampling criteria were established for each firm and the data for those firms whose sample met these criteria were expanded by a calculated factor to represent the total employment of the firm. A total of 24 firms met the sampling criteria and represented a total employment of 10,022 persons.

### Findings

This section presents findings pertaining to mode of transportation to work, automobile occupancy, automobiles per employee, travel time, I-287 use, distance traveled on I-287, place of residence of study area employees, new places of residence of study

Table 4-1

NUMBER OF SAMPLED ESTABLISHMENTS BY PERCENTAGE RETURNS  
OF THE EMPLOYEE QUESTIONNAIRE

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>PERCENTAGE OF RETURN</u>	<u>NUMBER OF ESTABLISHMENTS</u>
1 - 10	2
11 - 20	5
21 - 30	5
31 - 40	9
41 - 50	1
51 - 60	3
61 - 70	1
71 - 80	4
81 - 90	0
91 - 100	<u>1</u>
TOTAL	31

Unweighted mean: 39.8 per cent.

area employees, and I-287 use as related to changes in travel time. The basic approach to the analysis of most of these subjects was to describe how the sampled establishments varied, to explain this variation as much as possible, and then, to estimate the overall average for the study area. Included is an examination using graphic analysis which illustrates how I-287 was used by employees in selected locations.

Mode of Transport to Work- Table 4-2 shows the distribution of sampled establishments by percentage of employees traveling to work by automobile. The important characteristic to note is that at 21 of the 24 establishments over 98 per cent of the work trips are accomplished by automobile. Most of these establishments are located in industrial districts, zones, or parks which are generally outside walking distance of residential areas. Bus service is limited to the high-density sections of the corridor near Edison, New Brunswick, Highland Park, and Metuchen. Industries in the areas with bus service, however, all show auto use above 98.0 per cent.

The results from three firms indicated auto usage of 98.0 per cent or less. These firms were located in different sections of the I-287, I-95 corridor and were established in different time periods. The majority of persons responding reported that they used bus service for the major portion of their trip which usually

Table 4-2

NUMBER OF SAMPLED ESTABLISHMENTS BY AUTOMOBILE USAGE

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>AUTO USERS AS A PER CENT OF TOTAL EMPLOYMENT</u>	<u>NUMBER OF SAMPLED ESTABLISHMENTS</u>
100	10
98.1 - 99.9	11
96.1 - 98.0	1
94.1 - 96.0	1
Less than 94.1	<u>1</u>
TOTAL	24

Unweighted mean: 98.7 per cent.

---

SOURCE: In response to the question: "What method of transportation do you usually use for the greatest portion of your trip from home to work?"

terminated near an interchange or some convenient access point at which they were picked up by a co-worker in an auto. Zones of residence of these bus users were in eastern Middlesex or Union counties.

A similar pattern of mixed mode transport was indicated by train users. In total, bus, train, and persons who walked to work accounted for slightly more than 3 per cent of all employees.

It appears, then, that the automobile is unquestionably the dominant mode of travel to work at all locations and at all types of establishments, regardless of location in the I-287, I-95 corridor. Most employees who do not use autos for the greater portion of their work trip usually use it for the final portion. Very few persons walk to work.

Automobile Occupancy- Table 4-3 shows the distribution of sampled establishments by the average number of persons per car during the trip to work. One half of the establishments sampled had an average of from 1.05 to 1.24 persons per car. However, the weighted average of all establishments was 1.08 indicating that the distribution was skewed to those establishments with lower occupancy ratios.

The six firms with ratios above 1.15 persons per car shared one characteristic. All of these firms had recently relocated from

Table 4-3

NUMBER OF SAMPLED ESTABLISHMENTS BY AVERAGE AUTOMOBILE  
OCCUPANCY DURING THE TRIP TO WORK

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>AVERAGE AUTOMOBILE OCCUPANCY</u> (persons per car)	<u>NUMBER OF ESTABLISHMENTS</u>
1.00	5
1.01 - 1.04	6
1.05 - 1.09	4
1.10 - 1.14	3
1.15 - 1.19	4
1.20 - 1.24	1
1.25 - 1.29	-
1.30 - 1.34	-
1.35 - 1.39	<u>1</u>
TOTAL	24

Weighted average: 1.08 persons per car.

SOURCE: In response to the question: "If you usually travel by automobile, do you belong to a carpool? If yes, how many persons including yourself were in the car?"

places in the Newark-New York City area and had retained many of their personnel. This would indicate that because these persons had worked together previously and had homes still oriented to their former work location, they found carpooling a convenient solution to commuting problems. In addition, many of these same persons probably shared rides to work in the cities where this practice saved time, money, and solved limited parking problems.

Those five firms where all employees drove to work fall into three general groups as follows:

New establishment or former location in another state--two firms.

New site within 10 minutes travel time of old--two firms.

Has been in same location for 37 years--one firm.

Employees in all three groups would tend to have their residence oriented toward their place of work. Quite probably, these residence locations are suburban and there are two vehicles per family. Suburban residential locations may be so diverse as to require individual transportation.

The average occupancy for the firms of 1.08 persons per car provides an interesting comparison with the average number of persons per car for work trips in several urban areas as shown

in Table 4-4. In every case, the number of persons per car for urban work trips was considerably higher. This would substantiate the hypothesis that, as industry or employment locations tend toward suburban highway locations, not only does dependence on the automobile by employees as a mode of transport increase but individual use also increases.

Analysis of the data by other measures of firm characteristics showed that automobile occupancy did not vary consistently with size of firm in terms of employment or with location of establishment. However, it was noticed that average auto travel time usually varied directly with average occupancy. As occupancy increased, travel time also tended to increase.

Travel Time- The distribution of sampled establishments by the mean automobile travel time reported by employees is shown in Table 4-5. The distribution is bimodal at 18 to 22 minutes and 28 to 32 minutes. These two time groups represent 75 per cent of the establishments. The range of times, however, varied from 12 to 38 minutes.

Location and date located would appear to be the best explanation of differences in work travel time to these two groups of firms. In the lower travel time group, 18 to 22 minutes, the majority of the industries were located near established sources

Table 4-4

AVERAGE NUMBER OF PERSONS PER CAR, WORK TRIPS  
BY RESIDENTS IN SELECTED URBAN AREAS

<u>URBAN AREA</u>	<u>CARS OWNED</u>	<u>WORK TRIPS</u>		<u>AVERAGE PERSONS PER CAR</u>
		<u>Total</u>	<u>Drivers and Passengers</u>	
Chicago	1,342,000	2,033,000	1,369,000	1.21
Detroit	846,000	1,237,385	974,445	1.22
Washington	398,000	614,733	427,849	1.43
Pittsburgh	393,000	459,931	353,045	1.22
St. Louis	367,000	516,054	412,044	1.25
Houston	256,000	350,009	288,770	1.29
Kansas City	258,000	384,805	356,291	1.25
Phoenix	139,000	153,718	147,695	1.16
Nashville	107,000	150,393	134,376	1.31
Fort Lauderdale	77,600	61,300	59,200	1.20
Charlotte	61,800	97,070	86,697	1.22
Reno	22,700	21,084	20,534	1.24
AVERAGE	-	-	-	1.25

SOURCE: Wilbur Smith and Associates, Future Highways and Urban Growth. The Automobile Manufacturers Association, 1961. Appendix Table A-18, p. 348.

Table 4-5

NUMBER OF SAMPLED ESTABLISHMENTS BY AVERAGE DURATION  
OF EMPLOYEE TRIPS BY AUTOMOBILE

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>MEAN TRAVEL TIME OF AUTO USERS</u>	<u>NUMBER OF ESTABLISHMENTS</u>
12.0 - 13.9	1
14.0 - 15.9	-
16.0 - 17.9	1
18.0 - 19.9	5
20.0 - 21.9	6
22.0 - 23.9	2
24.0 - 25.9	-
26.0 - 27.9	-
28.0 - 29.9	4
30.0 - 31.9	4
32.0 - 33.9	-
34.0 - 35.9	-
36.0 - 37.9	<u>1</u>
TOTAL	24

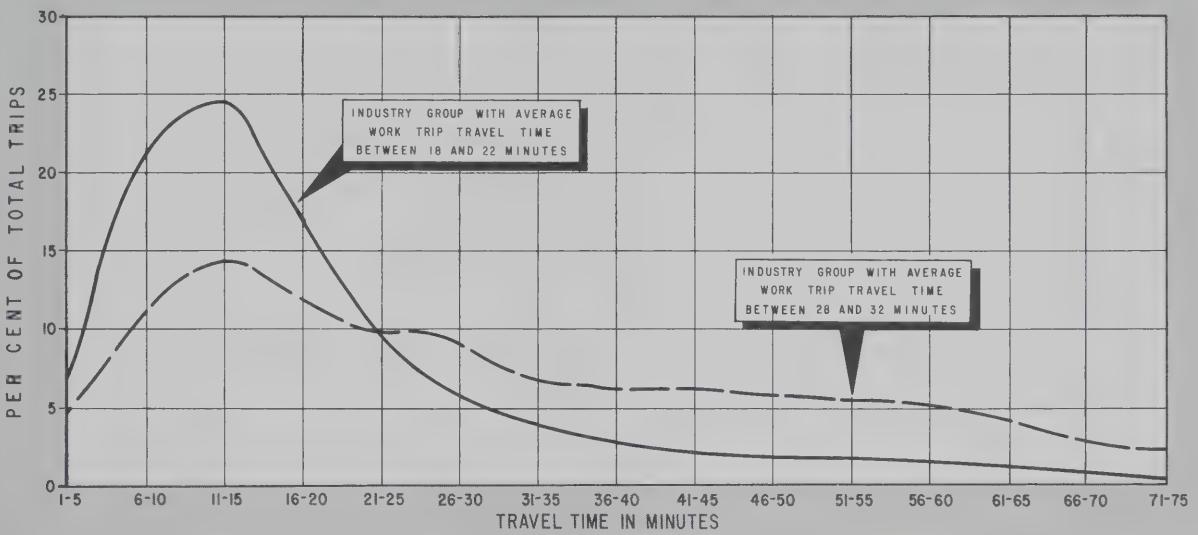
SOURCE: In response to the question: "How long does it usually take you to travel from home to work?"

of labor from which they undoubtedly draw a significant proportion of their labor force. In addition, 7 of the 11 firms in this group were established at their present location prior to the opening of I-287.

The firms in the other time group, 28 to 32 minutes, may be characterized as the antithesis of the lower travel time group. Only one firm is located in or adjacent to the population concentrations of the Somerville-Bound Brook or Metuchen-Edison areas, and this firm located in the 1940's. All the other firms have located since 1960, and five of the seven located since I-287 was opened.

The analysis points up the importance firms place on employee accessibility or accessibility to labor force. The older firms located nearer population concentrations than the newer firms in order to assure this accessibility to a large proportion of their labor force.

The travel time distributions of these two groups of industries are depicted in Figure 4-1. The distribution representing the industry group with the lower average travel time (18 to 22 minutes) is skewed sharply toward the lower travel times with the distribution mode at 11 to 15 minutes. Trips of 15 minutes or less accounted for over 53 per cent of all trips. From the modal



**WORK TRIP TRAVEL TIME DISTRIBUTION  
FOR TWO GROUPS OF INDUSTRIES  
I-287, I-95 CORRIDOR  
MIDDLESEX AND SOMERSET COUNTIES  
NEW JERSEY  
1967**

*Wilbur Smith and Associates*

**FIGURE 4-1**



point, the distribution declines sharply indicating few trips of long duration.

The curve representing the industry group with the higher average travel time (28 to 32 minutes) shows a rather level distribution with a slight skew to the lower travel times. Similar to the lower average travel time group, the modal point is 11 to 15 minutes, however, those trips under 15 minutes represent slightly more than 30 per cent of all trips. The high proportion of long duration trips is corroborative of the two employment characteristics of these firms. The first was mentioned in a previous section, that is, that many of these newer firms having moved from other places in the region have kept many of their personnel who must now travel longer distances to work. As industry has developed in the I-287 corridor, the available supply of certain categories of labor in the immediate area has become depleted requiring labor recruitment from areas farther away. (This was a common complaint heard from managers in response to the management interview.) These two factors and the influence of I-287 will be discussed further in a later section.

Trip Length Distribution- Trip length distributions are shown in Table 4-6 for total trips by automobile, trips using I-287 and not using I-287, and all trips by other means. Mean and median times are given for each of these distributions. The

Table 4-6

PERCENTAGE DISTRIBUTION OF PERSON TRIPS TO WORK AT  
 SAMPLED ESTABLISHMENTS BY TRIP DURATION,  
 HIGHWAY USED, AND TRAVEL MODE

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

<u>DURATION OF TRIP (minutes)</u>	TRIPS BY AUTO			<u>OTHER MODES</u>
	<u>Total</u>	<u>I-287, I-95 Users</u>	<u>Nonusers (per cent)</u>	
1 - 5	7.0	0.9	10.6	7.0
6 - 10	18.8	8.4	24.9	5.4
11 - 15	21.9	18.8	23.8	4.7
16 - 20	16.1	18.7	14.5	14.8
21 - 25	9.2	12.9	6.9	7.9
26 - 30	9.4	12.3	7.7	19.7
31 - 35	3.9	5.5	3.0	0.0
36 - 40	3.1	4.4	2.4	2.4
41 - 45	2.9	5.0	1.7	9.1
46 - 50	2.4	3.9	1.6	0.0
51 - 55	0.5	1.0	0.2	0.0
56 - 60	2.3	3.9	1.4	18.1
61 - 65	0.3	0.7	0.0	0.0
66 - 70	0.5	0.8	0.3	4.8
71 and over	<u>1.7</u>	<u>2.8</u>	<u>1.0</u>	<u>6.1</u>
TOTAL	100.0	100.0	100.0	100.0
Median	15.7	21.2	13.1	27.6
Mean	22.4	28.4	18.8	37.5

SOURCE: In response to the question: "What method of transportation do you usually use for the greatest portion of your trip from home to work?"

mean duration of auto trips using I-287 was 28.4 minutes, which was almost 10 minutes longer than that of trips not using I-287 and 6 minutes longer than the average for all auto work trips. All trips by other modes had an average duration of 37.5 minutes, which was 67 per cent greater than total auto trips.

A graph of the trip length distribution of all auto trips, those using I-287 and those not using I-287, is shown in Figure 4-2. It can be seen that I-287 was used relatively infrequently for trips of 10 minutes or less, but usage was higher than average for trips of 15 minutes or more.

Study Area Average- The mean work-trip duration for all workers traveling by automobile was 22.4 minutes. This time was higher than average areawide work-trip durations computed from origin-destination surveys in large urban areas, but is right in line with work trip travel times found in two fairly recent nationwide surveys. Mean travel times found in origin-destination surveys are as follows:(2)

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(2) Data listed in Traffic Planning for the North Central Freeway, prepared by Wilbur Smith and Associates and Alan M. Voorhees and Associates for the District of Columbia Department of Highways and Traffic, and the Maryland State Roads Commission, April, 1966, Table 20, p. 39.

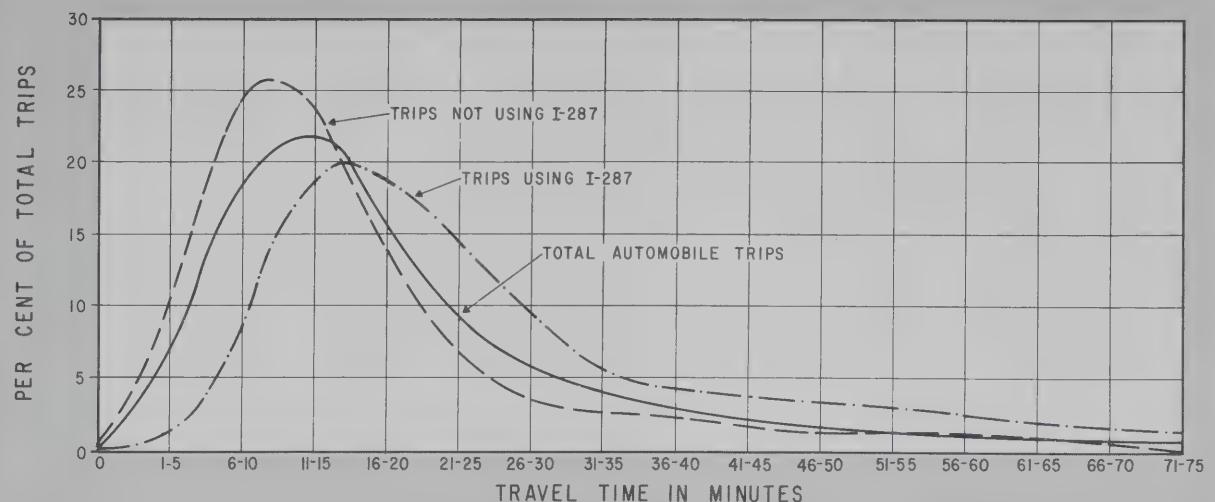
<u>URBAN AREA</u>	<u>AUTO DRIVER WORK-TRIP DURATION</u> (minutes)
Minneapolis-St. Paul	12.5
Pittsburgh	12.6
Washington, D. C.	14.3
Baltimore	16.7
Los Angeles	16.8
Philadelphia	20.1

Mean times of auto trips to work found in two recent surveys by the Institute for Social Research, University of Michigan, were 21.5 and 24.7 minutes. The universe sampled in both surveys was "all families living in private dwellings in metropolitan areas in the United States, exclusive of the New York area." (3)

I-287 Use as Related to Travel Time- The longer the trip, the higher the probability of I-287 use. Figure 4-3 illustrates the strong relationship between trip duration and I-287 use. The facility was used by over 50 per cent of the trips with a duration of over 20 minutes, but users accounted for less than 14 per cent of trips of less than 11 minutes. Table 4-7 shows the data on which Figure 4-3 is based and also compares the cumulative percentages

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(3) John B. Lansing, Residential Location and Urban Mobility: The Second Wave of Interviews, Survey Research Center, Institute for Social Research, The University of Michigan, January, 1966, p. iii. Mean travel times were calculated from grouped data in Table 46 of the cited report and Table II-4 in John B. Lansing, et. al., Residential Location and Urban Mobility (same Publisher), June, 1964.

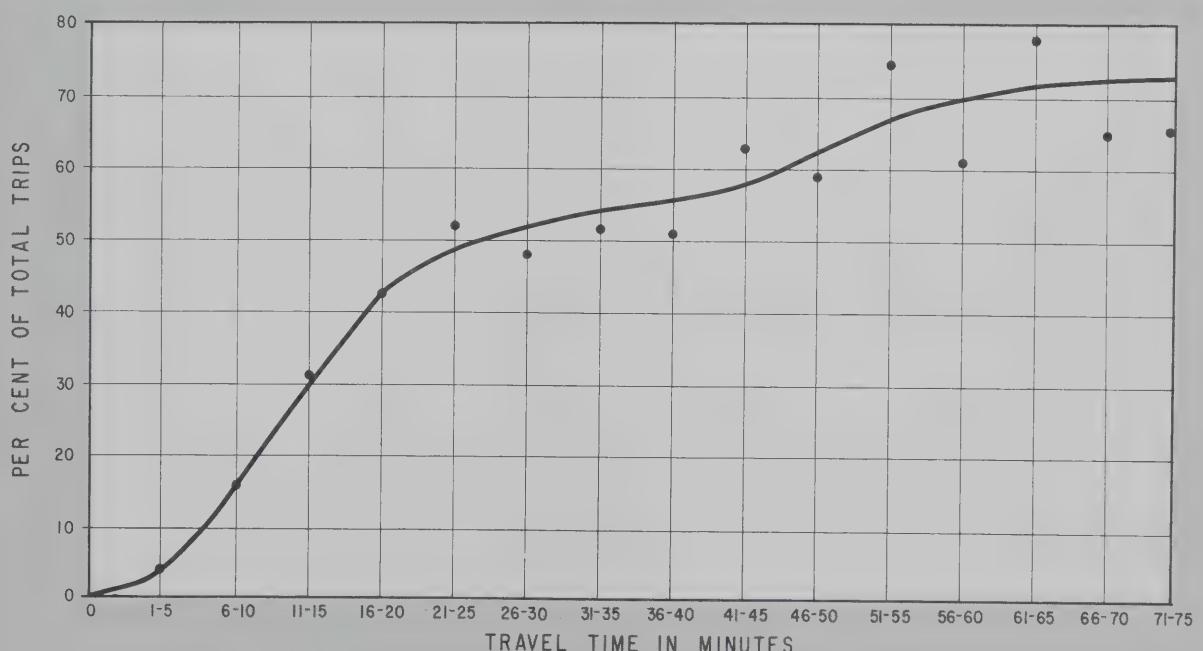


**TRIP LENGTH DISTRIBUTION\***  
MIDDLESEX AND SOMERSET COUNTIES  
NEW JERSEY  
1967

\*WORK TRIPS BY AUTO TO SAMPLED ESTABLISHMENTS.

Wilbur Smith and Associates

FIGURE 4-2



**INTENSITY OF USE AND TRIP DURATION\***  
I-287, I-95 CORRIDOR  
MIDDLESEX AND SOMERSET COUNTIES  
NEW JERSEY  
1967

\*WORK TRIPS BY AUTO TO SAMPLED ESTABLISHMENTS.

Wilbur Smith and Associates

FIGURE 4-3



Table 4-7

I-287 USE AS RELATED TO DURATION OF WORK TRIPS  
AT SAMPLED ESTABLISHMENTS

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>DURATION OF TRIP (minutes)</u>	<u>I-287 USERS AS PERCENTAGE OF TOTAL TRIPS BY AUTO<sup>(1)</sup></u>	<u>CUMULATIVE PERCENTAGE OF TOTAL TRIPS BY AUTO</u>	<u>CUMULATIVE PERCENTAGE OF I-287 TRIPS</u>
1 - 5	5.0	7.0	0.9
6 - 10	16.7	25.8	9.4
11 - 15	31.9	47.7	28.1
16 - 20	43.3	63.7	46.8
21 - 25	52.5	72.9	59.7
26 - 30	48.7	82.3	72.1
31 - 35	52.2	86.2	77.5
36 - 40	51.5	89.4	81.9
41 - 45	63.5	92.3	86.9
46 - 50	59.5	94.7	90.7
51 - 55	75.1	95.2	91.8
56 - 60	61.6	97.6	95.6
61 - 65	78.9	98.4	96.4
66 - 70	65.2	98.8	97.2
71 - 75	66.0	99.1	98.0
76 and over	64.3	100.0	100.0

41-6

(1) In total, I-287 users represented 37.2 per cent of all work trips.

by trip length of trips using I-287 and total auto trips. It can be seen, for example, that trips of over 20 minutes accounted for 53.2 per cent of all work trips using I-287, but only 36.3 per cent of all trips by auto.

I-287 Use- Establishments in the I-287, I-95 corridor in Middlesex and Somerset counties varied widely in the extent to which their employees used I-287 during the work trip. Users ranged from 17.6 to 88.1 per cent of the employees traveling to work by automobile in the 24 establishments sampled in this investigation. As shown in Table 4-8, the distribution was rather evenly divided throughout the range.

Use of I-287 on work trips was more frequent at the newer establishments sampled than at the older establishments. The average age of establishments with below median usage of I-287 was 16.4 years while the average age of establishments with above median usage was 3.4 years as of 1968.

Average usage in these older firms was 26.6 per cent while the average usage of the firms in the upper half of the distribution was more than twice as high at 59.4 per cent. As mentioned in the section on trip duration, most of these older firms were either in or near Somerville or near Metuchen where local labor was readily available and most work trips tended to be under 20

Table 4-8

NUMBER OF SAMPLED ESTABLISHMENTS  
 BY PERCENTAGE OF EMPLOYEES USING I-287  
 AND AVERAGE WORK TRIP TRAVEL TIME

I-287, I-95 Corridor  
 Middlesex and Somerset Counties  
 New Jersey  
 1967

<u>I-287 USERS AS A PER CENT OF AUTO USERS</u>	<u>NUMBER OF ESTABLISHMENTS</u>	<u>AVERAGE WORK TRIP TRAVEL TIME (minutes)</u>
0 - 9.9	-	-
10.0 - 19.9	2	19.9
20.0 - 29.9	5	22.3
30.0 - 39.9	5	22.1
40.0 - 49.9	3	20.6
50.0 - 59.9	4	25.3
60.0 - 69.9	3	30.3
70.0 - 79.9	-	-
80.0 - 89.9	2	28.9
90.0 - 99.9	-	-
Average	37.2 per cent	
Median (calculated)	40.6 per cent	
Unweighted mean	43.0 per cent	

minutes in duration. These same trips may be characterized as non-I-287 trips.

The firms indicating a high level of I-287 usage tended to be located near less intensively populated areas with over half of the work trips taking in excess of 20 minutes.

Distance Traveled on I-287- The mean distance traveled on I-287 by employees at all sampled establishments on trips to work was 5.8 miles. Average mileage for the trip from work was slightly less at 5.7 miles. The difference may be accounted for by the use of different directional interchanges and because some employees take different routes home or do not go directly to their residence. These distances include mileage driven on I-287 outside the study corridor up to and including the interchange with Mount Airy Road near Basking Ridge, New Jersey.

Table 4-9 gives the percentage distribution of to and from work trips by distance traveled on I-287. It is apparent that the distribution was skewed toward the shorter trips. However, it is interesting that the cumulative distribution of trips to work tended to be slightly less than from work trips up to a distance of 12.0 to 13.9 miles.

Table 4-9

PERCENTAGE DISTRIBUTION OF AUTOMOBILE TRIPS TO  
AND FROM WORK BY DISTANCE TRAVELED ON I-287

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>DISTANCE TRAVELED IN MILES</u>	<u>PERCENTAGE DISTRIBUTION OF AUTO TRIPS</u>		<u>CUMULATIVE PERCENTAGE OF AUTO TRIPS</u>	
	<u>To Work</u>	<u>From Work</u>	<u>To Work</u>	<u>From Work</u>
0.0 - 1.9	17.3	18.4	17.3	18.4
2.0 - 3.9	24.9	25.1	42.2	43.5
4.0 - 5.9	16.3	15.1	58.5	58.6
6.0 - 7.9	19.3	19.3	77.8	77.9
8.0 - 9.9	6.2	6.3	84.0	84.2
10.0 - 11.9	5.1	5.1	89.1	89.3
12.0 - 13.9	8.9	8.7	98.0	98.0
14.0 - 15.9	0.2	0.2	98.2	98.2
16.0 - 17.9	1.1	1.1	99.3	99.3
18.0 - 19.9	0.5	0.5	99.8	99.8
20.0 - 21.9	0.1	0.1	99.9	99.9
22.0 - 23.9	0.1	0.1	100.0	100.0

### Place of Residence of Employees

The percentage distribution by place of residence of employees in sampled establishments in Middlesex and Somerset counties, excluding Middlesex and Somerset county residents, is shown in Table 4-10.

The most striking difference indicated by these data was the disparity in the proportion of Hunterdon County residents employed in the two counties. A similar condition was apparent with Hudson County residents although the reasons were probably quite different. Hunterdon County, a sparsely populated and predominantly rural area, shows signs of becoming something of a "bedroom" community for the more heavily industrialized eastern areas. On the other hand, Hudson County (Jersey City) is densely populated and as shown in Table 3-5 was the former site of four industries which have moved into the I-287, I-95 corridor since 1960. Thus, many of the Hudson County residents now employed in Middlesex County were probably formerly employed in their county of residence.

### Residential Location Patterns of Employees

The following section investigates and explains some important factors pertinent to the use of I-287 on the work trip.

Table 4-10

PERCENTAGE DISTRIBUTION OF THOSE EMPLOYED IN  
MIDDLESEX AND SOMERSET COUNTIES BY COUNTY OF RESIDENCEI-287, I-95 Corridor  
New Jersey  
1967

<u>PLACE OF RESIDENCE</u>	<u>ESTABLISHMENT LOCATION</u>	
	<u>Middlesex County</u>	<u>Somerset County</u>
Union County	49.7	42.3
Morris County	8.8	7.7
Monmouth County	6.9	5.3
Essex County	6.4	3.8
Hudson County	6.1	0.8
Bergen County	4.5	3.1
Mercer County	3.6	5.3
Hunterdon County	3.2	22.9
Other Areas	<u>10.8</u>	<u>8.8</u>
TOTAL	100.0	100.0

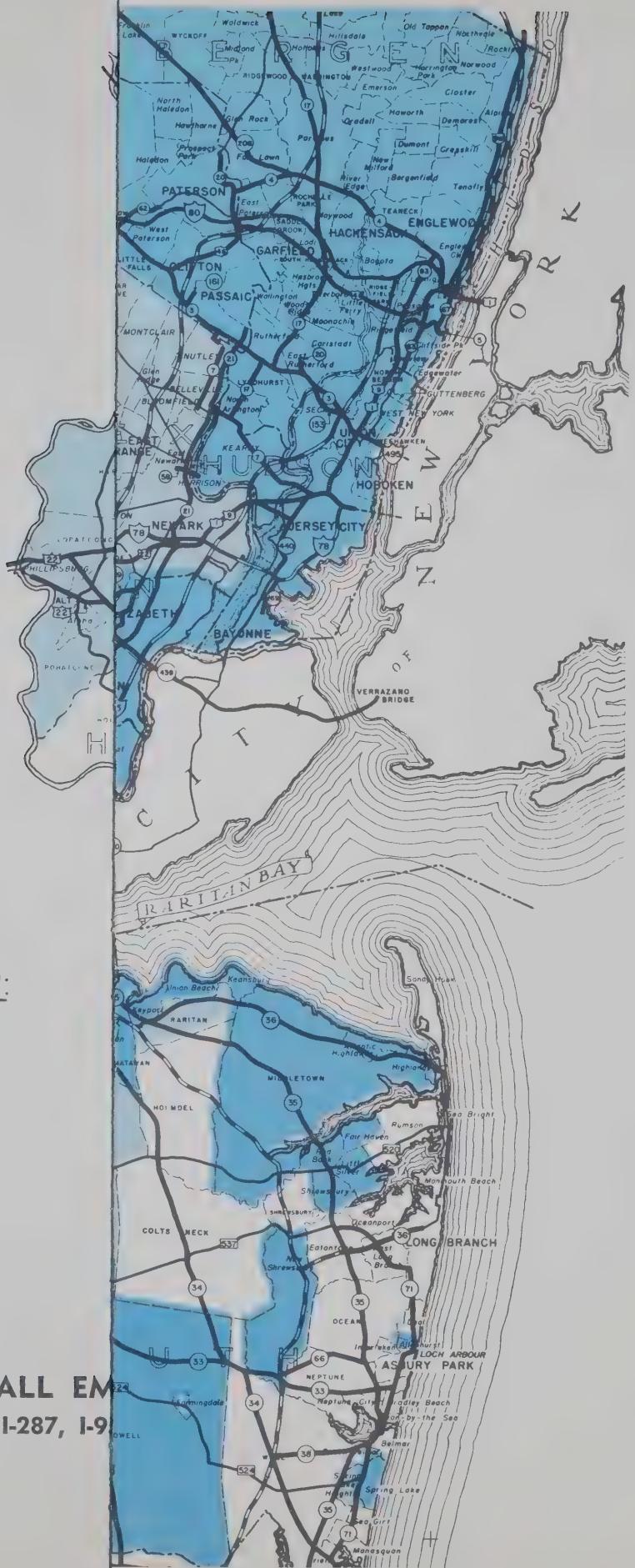
The place of residence of each employee as indicated on the questionnaire was coded to a residence zone. For Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset, and Union counties, municipalities were used as residence zones. Outside of this combination of contiguous counties, individual counties were used as residence zones. These data together with the responses to question 5, "In traveling to and/or from work, do you use I-287, (I-95)?", provided the basis for this analysis.

The most fundamental influence on the use of I-287 at any establishment was the relative location of employee residences with respect to the highway and the location of the establishment.

Figure 4-4 shows the residential location of employees at all sampled establishments in the corridor by use or nonuse of I-287.<sup>(4)</sup> The number of participating employees in Somerset County is greater than the number in Middlesex; therefore, the residence zones by use or nonuse were weighted by these establishments.

---

(4) Use or nonuse is determined by the proportion of residents of a zone reporting use of I-287. The break point was 50 per cent.



**FIGURE 4-4**

**ZONES OF RESIDENCE OF ALL EM  
BY USE OR NONUSE OF I-287, I-95  
NEW JERSEY  
1967**

*Wilbur Smith and Associates*

The place of residence of each employee as indicated on the questionnaire was coded to a residence zone. For Hunterdon, Mercer, Middlesex, Monmouth, Morris, Somerset, and Union counties, municipalities were used as residence zones. Outside of this combination of contiguous counties, individual counties were used as residence zones. These data together with the responses to question 5, "In traveling to and/or from work, do you use I-287, (I-95)?", provided the basis for this analysis.

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Figure 4-4 shows the residential location of employees at all sampled establishments in the corridor by use or nonuse of I-287.<sup>(4)</sup> The number of participating employees in Somerset County is greater than the number in Middlesex; therefore, the residence zones by use or nonuse were weighted by these establishments.

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(4) Use or nonuse is determined by the proportion of residents of a zone reporting use of I-287. The break point was 50 per cent.

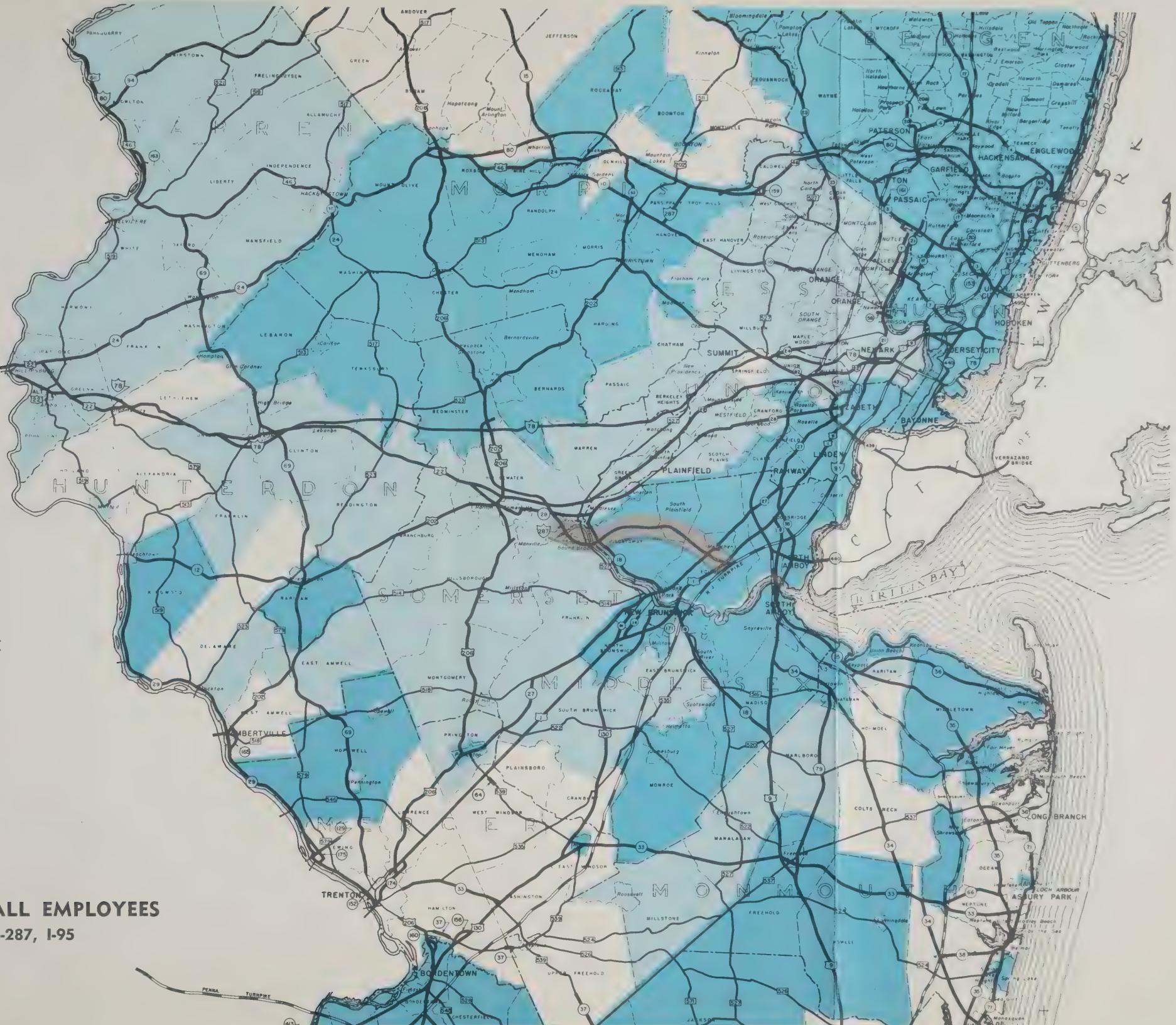


FIGURE 4-4

**ZONES OF RESIDENCE OF ALL EMPLOYEES  
BY USE OR NONUSE OF I-287, I-95  
NEW JERSEY  
1967**

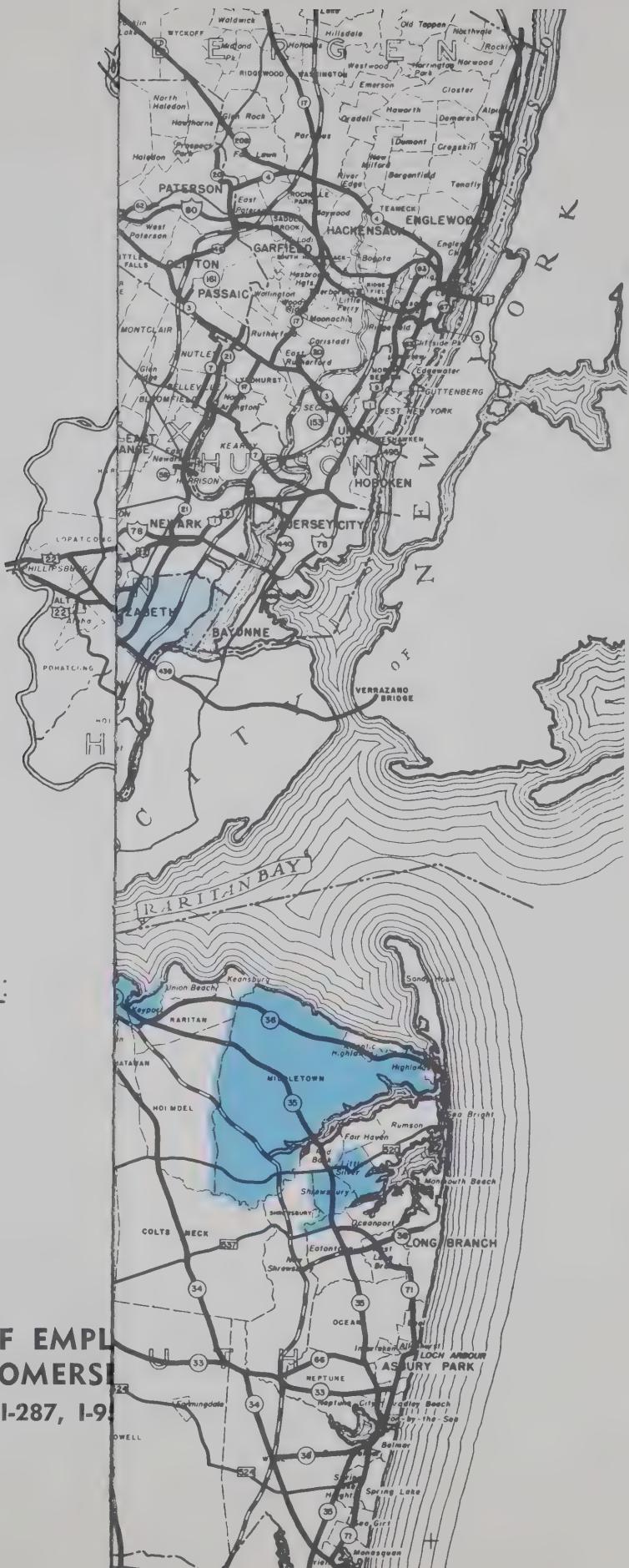


The usage zones generally follow the existing highway network and would be expected to represent least time routing. For example, employees residing to the southwest and west of I-287 in Somerset, Hunterdon, and Warren counties would probably use U.S. Routes 22, 206, and 202 and State Route 27 to Easton Avenue in New Brunswick. Employees residing to the northeast who do not use I-287 live in zones served by U.S. 22 and State Routes 28 and 527.

These routes usually were noncompetitive with the completed sections of I-287. Rather, they were supplementary serving areas not directly connected with the freeway. This is illustrated by the residence zones of users. Use zones for all establishments were in two general areas. The east, southeast, and northeast, and the northwest seem to be well served by I-287. In the northwest, I-287 interchanges with U.S. 206 and 202. The latter highways serve a large area of Morris County. From its crossing at the Raritan River, I-287 serves an area running east through Middlesex County. Along this section, I-287 intersects or is accessible from several major highways serving the northeast and southeast. These highways include U.S. Routes 1 and 9, the New Jersey Turnpike, and State Routes 27, 35, and 18. This has the effect of extending I-287's influence south into Monmouth County and north through the heavily populated areas of the eastern portion of Union County, and Hudson, Bergen, and Passaic counties.

As mentioned, the residential patterns for all establishments were weighted by the employees in Somerset County. Therefore, as would be expected, the residential pattern of employees by use or nonuse of I-287 at the large American Cyanamid plant near Somerville is very similar to the pattern for all establishments. This is shown in Figure 4-5. Residence zones in Hunterdon County were influenced by I-287 to greater extent than for all employees in Hunterdon County. This was probably due largely to matters of personal preference but, as I-78 through Hunterdon County is completed, I-287 will probably become an increasingly popular route to the employment centers in Somerset and Middlesex Counties.

Figure 4-6 shows the zones of residence of employees at six establishments near Centennial Avenue in Piscataway Township. The pattern, while similar to that for all establishments and American Cyanamid in that nonuse employees live in areas perpendicular to I-287 with good highways nearby, reveals several significant use considerations. A brief review of the characteristics of establishments in the Centennial Avenue area will aid in the explanation of this pattern. Of the six industries included in this analysis, four are on Centennial Avenue and two are situated at the eastern end with access to Possomtown Road. The average age of these plants in 1968 was about 2.7 years and each



**LEGEND:**

PLACE OF EMPLOYMENT

ZONE OF RESIDENCE OF EMPLOYEES':

NOT USING I-287, I-95

USING I-287, I-95

FIGURE 4-5

**ZONES OF RESIDENCE OF EMPLOYEES  
AT AMERICAN CYANAMID, SOMERVILLE,  
BY USE OR NONUSE OF I-287, I-95,  
NEW JERSEY**

1967

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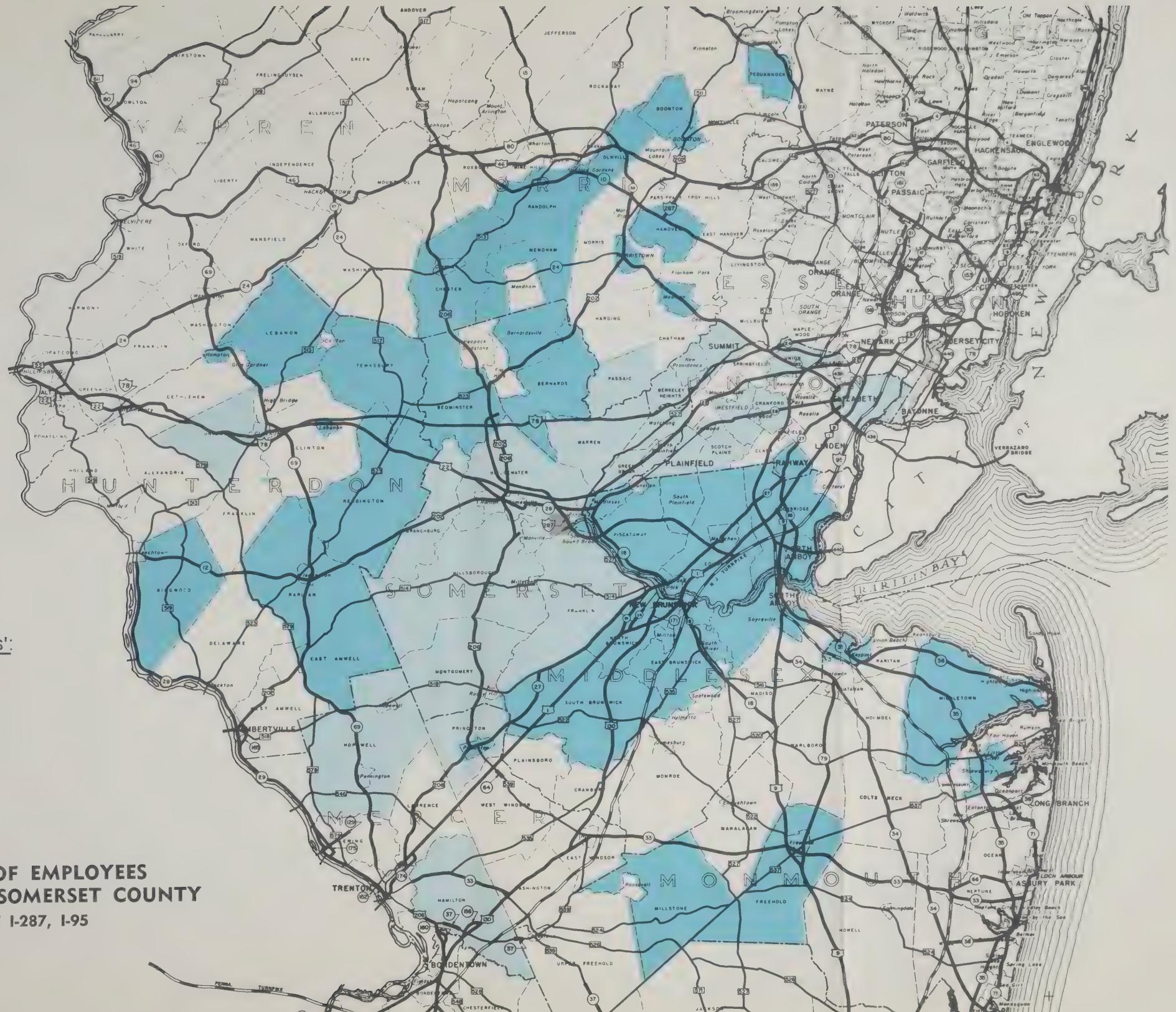
**FIGURE 4-5**

**ZONES OF RESIDENCE OF EMPLOYEES  
AT AMERICAN CYANAMID, SOMERSET COUNTY**

**BY USE OR NONUSE OF I-287, I-95**

**NEW JERSEY**

**1967**





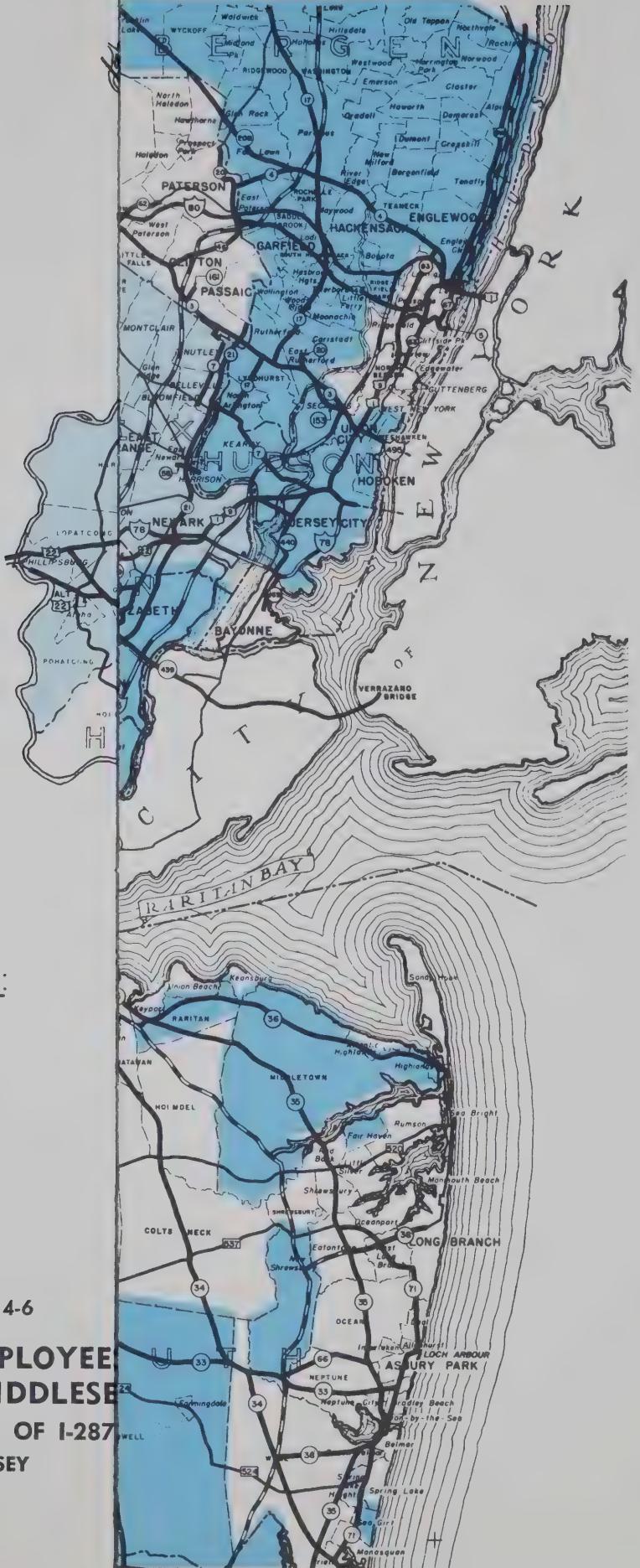
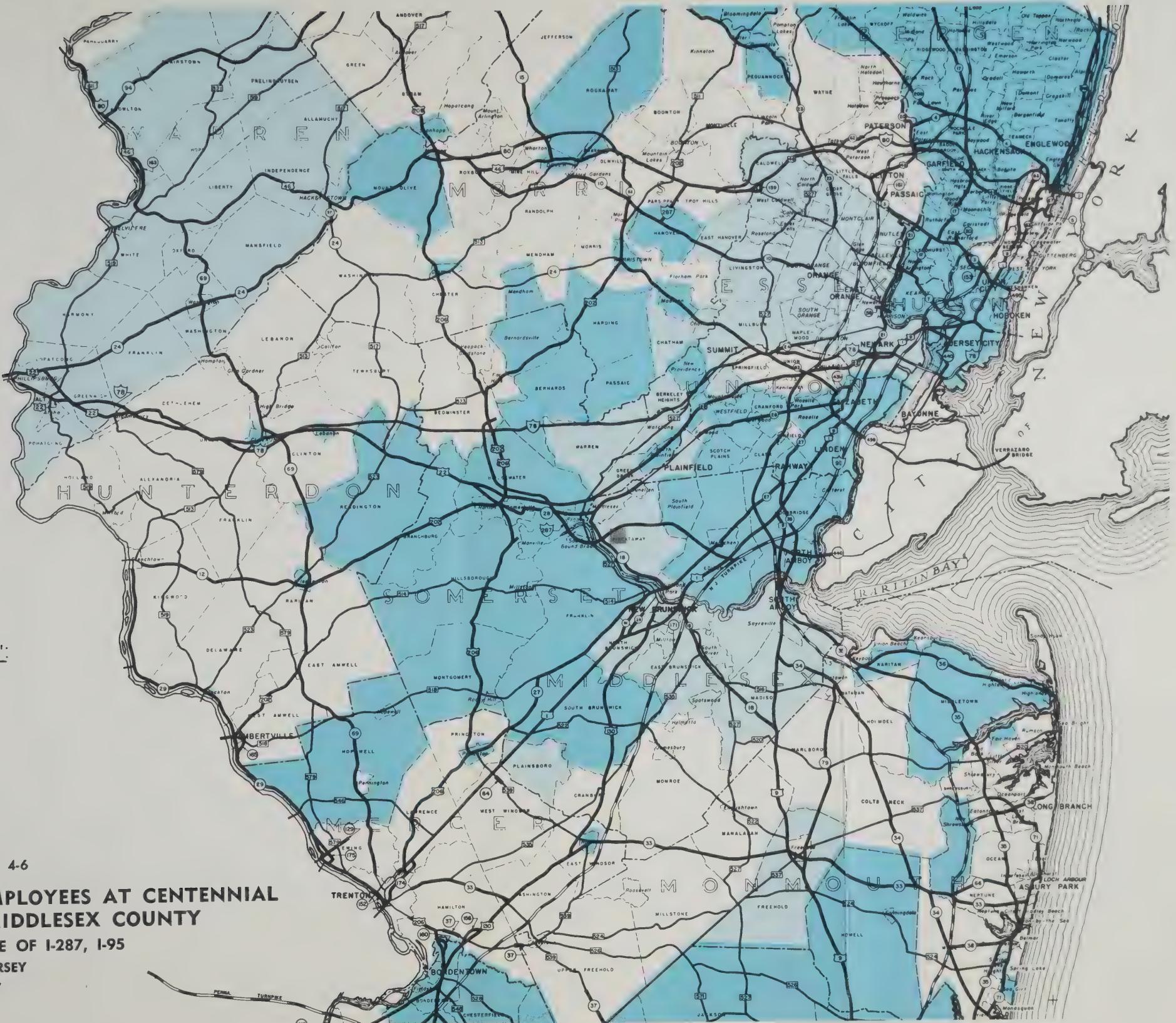


FIGURE 4-6

**ZONES OF RESIDENCE BY EMPLOYEE  
AVENUE COMPLEX, MIDDLESEX  
BY USE OR NONUSE OF I-287**  
NEW JERSEY

1967







was established since I-287 was opened in 1963. Centennial Avenue is directly accessible from the south via State Route 18 (River Road) through New Brunswick, and from the north via U. S. 22 and State Route 28 through Dunellen and Middlesex. The Raritan River is directly to the west of Centennial Avenue and I-287 provides the only easy route across the river from the west. The best alternative would be State Route 28 through Bound Brook and Middlesex.

With these determinants in mind, the residence pattern of users and nonusers of I-287 may be regarded as quite logical. The nonuser area to the south achieves access via State Routes 130 and 18, and the area to the north and northeast via State Routes 18 and 28 and U.S. 22. Employees living outside this rather small area seem to adjust their commuting patterns to maximize utilization of I-287 as a means of access to their places of employment. Those to the west probably use U.S. Routes 202, 206, and 22 as connectors with I-287, and those to the east use U.S. 1 and 9 and State Route 27.

Several significant findings are revealed in this analysis. The two most important determinants of I-287 use are establishment of location relative to employee residence and the existing highway network. Employees living in areas generally perpendicular to I-287 tend to use direct perpendicular routes. Most employees

making extensive lateral movements tend to adjust their commuting patterns to take advantage of convenience afforded by I-287. The facility was used most extensively for work trips to newer establishments in areas which had poor accessibility prior to the construction of the freeway. The primary areas of influence of I-287 were to eastern areas and areas to the northwest generally following its directional alignment.

#### Residence Relocation Characteristics

As shown earlier (Table 4-5), most of the firms which have relocated were formerly situated in the more densely developed areas of New Jersey such as Newark, Jersey City, and Union. Not only did these firms transfer certain personnel, but persons from these areas undoubtedly sought jobs in the Middlesex-Somerset area as indicated in the discussion on place of residence of employees. The purpose of this analysis is to determine if these persons are relocating and their relocation patterns.

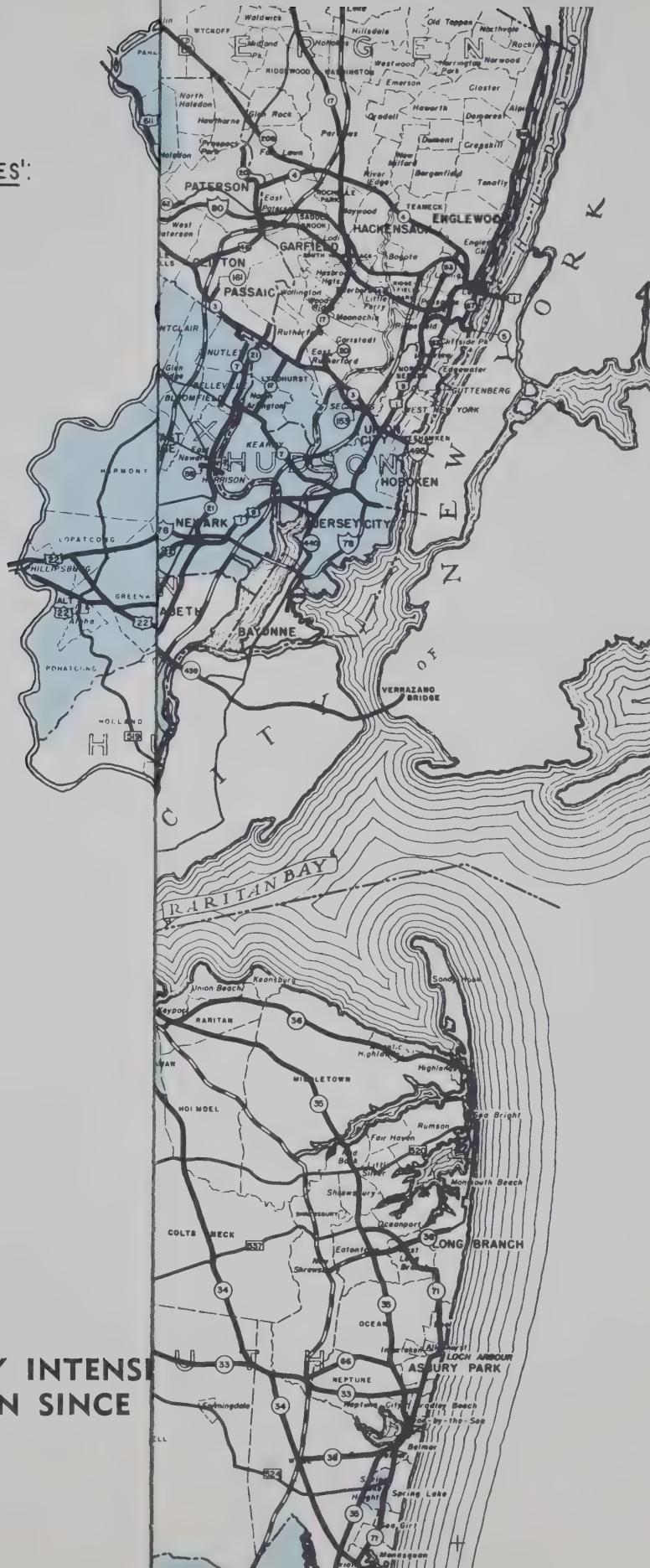
Only the employees of firms established since 1960 were considered since I-287 has probably been a greater influence since that time. Of the 2,519 employees represented by these firms, 20.2 per cent, or 509, had moved since becoming employed by the firms. Figure 4-7 shows the zones of residence of those who have moved. It illustrates the zones to which 15 or

**LEGEND:**

**ZONE OF RESIDENCE OF EMPLOYEES:**

15 FAMILIES OR MORE

LESS THAN 15 FAMILIES



**FIGURE 4-7**

**ZONES OF RESIDENCE BY INTENSITY  
EMPLOYEE RELOCATION SINCE**

**NEW JERSEY**

**1960-1967**

making extensive lateral movements tend to adjust their commuting patterns to take advantage of convenience afforded by I-287. The facility was used most extensively for work trips to newer establishments in areas which had poor accessibility prior to the construction of the freeway. The primary areas of influence of I-287 were to eastern areas and areas to the northwest generally following its directional alignment.

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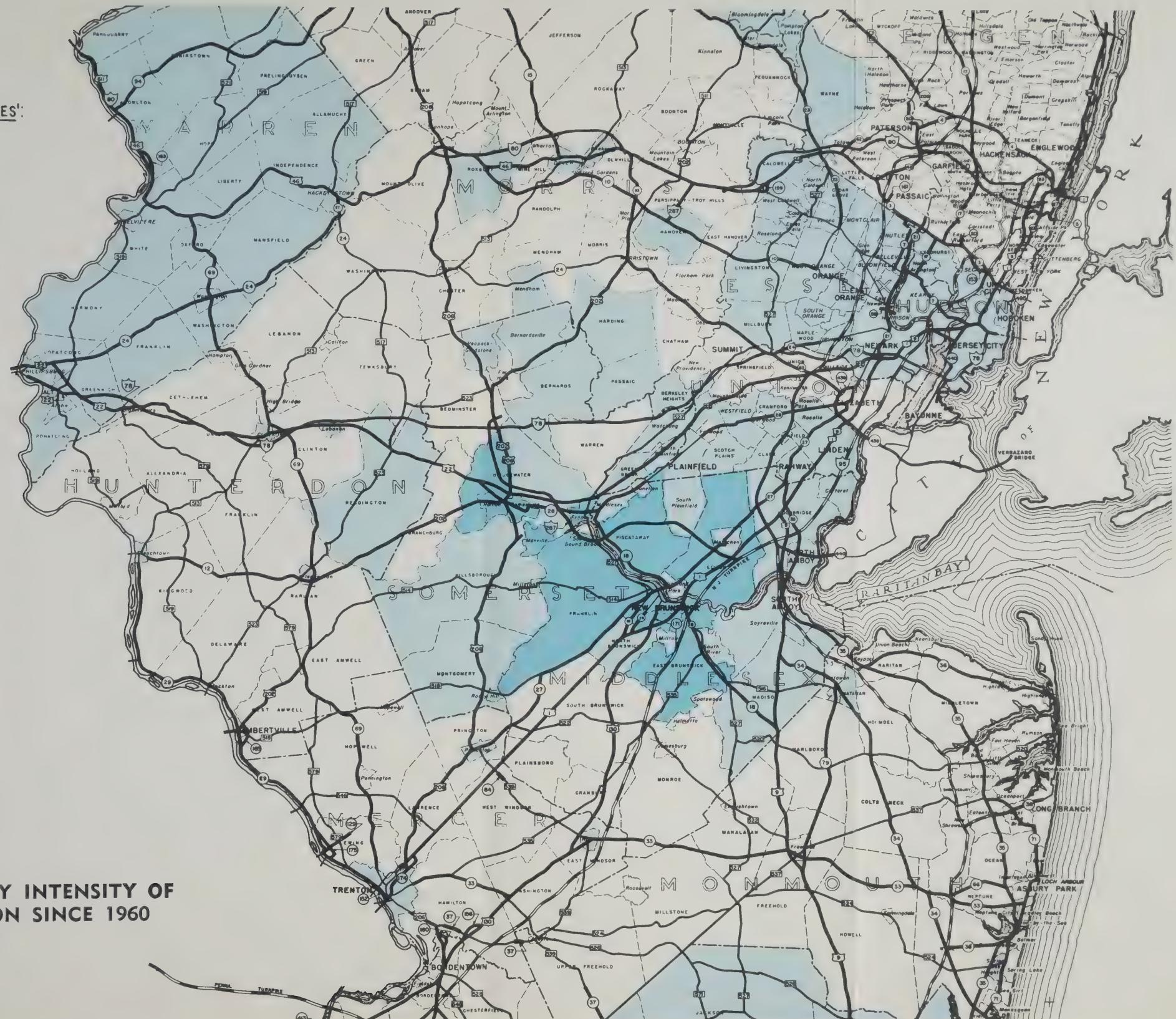


FIGURE 4-7

**ZONES OF RESIDENCE BY INTENSITY OF  
EMPLOYEE RELOCATION SINCE 1960**

NEW JERSEY  
1960-1967



more or less than 15 moves were made. The areas representing the most intensive residential relocating straddle the I-287, I-95 corridor or the highways which provide access to it. The areas of less intensive relocation are generally just outside the immediate corridor municipalities indicating that persons tend to move to locations within relatively short commuting time to work.

Work, of course, is not the only criterion of residential location. Other personal preferences often play a leading role as indicated by those areas of residential relocations well outside the I-287, I-95 corridor.

Although the majority of employees who relocated live near routes of direct access to work, 46.0 per cent of those who moved used I-287 on part of their work trip. Prior to moving, only 41.8 per cent used I-287. The analysis, although not too conclusive, would seem to indicate that a significant percentage of those moving were choosing locations where I-287 provided access to work and that this proportion was greater than the proportion using I-287 before the move. In addition, the percentage of those who have moved and use I-287 was significantly greater than the overall average (39.8 per cent) of I-287 users.



## Chapter 5

### OTHER IMPACTS

Two rather specific areas of economic and social impact were investigated in Chapters 3 and 4. The purpose of this chapter is to point out, discuss, and investigate several of the other impacts or influences which highways may have on the immediate area, the state, and the nation. Among the topics considered are the impact on residential areas and residents within the I-287, I-95 corridor, the effect on commercial centers, and the effect on municipal tax revenues of the economic development ensuing from construction of the highway. New Jersey's toll roads are examined in terms of their impact and the results of several impact studies are reviewed.

#### Residential Areas

As with the employee questionnaire there were basically two ways to approach data collection for residential areas. Since the employee questionnaire results provided good data on the residential-employment patterns of those employed by industries in the I-287, I-95 corridor, changes in residential patterns, and utilization of I-287 by employees on work trips, it was felt that interviews with residential developers and resident managers might provide data which would further emphasize the impact of I-287.

The municipalities in the I-287, I-95 corridor including those traversed by I-287 but outside the study area in Somerset County have experienced considerable residential construction pressure as shown in Table 5-1. Construction authorization totals from 1960 to 1963 were consistent, averaging about 2,000 dwelling units, annually. However, in 1964 and 1965 total authorizations jumped to 3,063 and 4,469, respectively.

Housing is, of course, very sensitive to monetary control and policy and has for this reason been considered a leading indicator of the state of the economy. In a particular limited geographical area, housing construction, while still sensitive to the availability of funds, is also responsive to population pressures, the availability of suitable sites, developer interest, and accessibility. Population pressure in the study area has been substantial as emphasized in the chapter on socioeconomic characteristics.

Availability of suitable sites is a distinctly different matter. Since about 85 per cent of the land area adjacent to I-287 in the study area is zoned for industrial uses, most land suitable for residential development is well removed from the highway. Because of population pressures, developers are keenly interested in developing potential residential sites.

Table 5-1

DWELLING UNITS AUTHORIZED  
BY MUNICIPALITY 1960-1965

I-287, I-95 Corridor  
Middlesex and Somerset Counties  
New Jersey  
1967

<u>MUNICIPALITY</u>	<u>YEAR</u>					
	<u>1960</u>	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>
Middlesex County						
Edison Township	653	709	770	650	1,087	2,002
Metuchen	71	86	127	92	77	36
Piscataway Township	323	367	231	391	539	967
South Plainfield Township	107	120	103	80	106	122
Subtotal	1,154	1,282	1,231	1,213	1,809	3,127
Somerset County						
Bedminster Township(1)	13	8	12	10	9	9
Bernards Township(1)	84	181	240	107	130	120
Bound Brook	42	27	29	38	36	52
Bridgewater Township	222	623	510	452	375	408
Far Hills(1)	4	1	1	3	1	10
Franklin Township	264	212	188	245	693	731
South Bound Brook	96	45	10	36	15	12
Subtotal	725	1,097	970	891	1,259	1,342
TOTAL	1,879	2,379	2,201	2,104	3,068	4,469
PER CENT CHANGE		26.6	-7.5	-4.4	45.8	45.7

(1) Although these municipalities were not included in the I-287, I-95 corridor, they are traversed by I-287 and would probably be affected by the highway.

SOURCE: The State of New Jersey Residential Construction Authorized by Building Permits, Annual Summaries, New Jersey Department of Labor and Industry.

In the course of this investigation, representatives from five different real estate, real estate development, or real estate development-management firms were contacted. Three of these firms were directly involved in residential complexes near I-287. The complexes they represented provided dwellings for 768 families in both single family dwellings and garden type apartments. In all cases the developments have been completed since I-287 was opened to traffic in 1963.

When new, the single family residences in the areas studied sold for between \$20,000 and \$24,000. Today the price of the average house has increased by about \$3,000. Several factors were credited with influencing this increase. Given as the primary factor was the rapid development of industry in the I-287, I-95 corridor which has generally caused housing demand to increase at a faster rate than available supply. In fact, in the municipalities of Middlesex County, particularly in the intensively developed eastern sections of the corridor, there was considered to be a serious shortage of single family residences.

Proximity effects or the influence of a highway such as I-287 on the value of residential properties abutting the right-of-way has been a question of debate and conflicting evidence. In some cases, abutting properties have been shown to decline in

value due to noise, fumes, and glare associated with such locations. In other cases values have not been adversely affected. As reported by an agency handling single family residential properties in an area developed since the completion of I-287, no proximity effects were recognized. Those houses abutting I-287 were originally sold for basically the same price as the same house well removed from the highway. Furthermore, the location of sale from first to last was haphazard with no apparent pattern in buyer preference.

#### Multifamily Developments

The resident managers and developers of two garden apartment developments were contacted. These two developments included 388 apartments and were within one-half mile of I-287. Monthly rental rates, including utilities, varied from \$125 to \$175.

In both cases, I-287 was considered a major determinant of the decision to develop the area. Primary attributes of I-287 were access and the recent industrialization of the corridor. Access was believed very important to residents not only to local industries but also to the employment centers of the New York and Newark metropolitan areas.

According to the interviewees, most convenience and some G. A. F. shopping was done in the retail centers of New Brunswick, Edison, and Somerville.<sup>(1)</sup> However, many residents traveled to New York for the bulk of their G. A. F. purchases. It was believed that New Brunswick, Edison, Somerville and New York were also the areas frequented for most social and cultural pursuits.

Since these apartments located near I-287 were on a direct access route to New Brunswick, trips to that city usually did not utilize I-287. However, the best access to the other retail, social, and cultural centers was provided by I-287.

#### Former Residential Locations

In the chapter on work trips it was indicated that the most intensive residential pressure was in those municipalities on either side of I-287. From this and the analysis of employee residential locations it was inferred that many of the people moving into the area were relocating from areas to the north and northeast. Representatives of the residential developments had the same observations. One interviewee indicated that over 90 per cent of the residents in the subdivision he handled were from

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(1) G. A. F.: general merchandise, apparel, and furniture. These are also known as shopper goods and usually require a special trip for their purchase.

the Newark - New York area. The others indicated that about 50 per cent of their residents had formerly resided in the same area.

While such seemingly large proportions were moving from areas in the northeast, all were not moving because they worked nearby. Although industry relocation and increasing job opportunities were certainly responsible for many dwelling relocation decisions, it was observed that people were moving out of higher density areas to the relatively low density areas of the I-287, I-95 corridor and retaining former employment positions. This was related to the excellent access provided by I-287 through its connections with other highways to these employment areas.

#### Future Development

All interviewees agreed that additional housing development was needed but, because of existing zoning, preferred sites near I-287 interchanges were not available.

The opinion was that Interstate highways provided access to many areas suitable for residential development. Lead time from planning to construction and occupancy varied, depending to a large degree on the time required to receive municipal approval.

## Commercial Centers

In the last two decades the general section of the economy which has experienced the greatest employment growth in suburban areas is that of consumer service. Included in these activities are personal services, financial services, recreation, lodging and eating places, most medical services, and all retail trade establishments.

Since in most cases the location and arrangement of establishments in these categories is a function of consumer convenience in terms of access, these businesses are usually found either in business districts or shopping centers or in strips along major arterials. While some of these establishments may be found in isolated locations, they are usually small, often individually owned businesses and represent a low proportion of the total, both in terms of total business volume and employment.

Thus, if a major locational criterion is customer accessibility by auto, then a major suburban highway may be expected to influence the location and spatial distribution of commercial development.

There are three major clusters of commercial activity which might have been influenced by I-287. These include Somerville, New Brunswick, and U.S. 1 in Edison, notably the Menlo Park Shopping Center.

For the purposes of this report the Menlo Park Shopping Center was chosen for study. The purpose was two-fold. Since Menlo Park is a regional shopping center, changes in the trade area of businesses in the center would indicate a change in the shopper orientation of the population served by the freeway. In addition, acceptance of the shopping center by customers would probably be somewhat indicative of the types of effects the highway will have on commercial land use.

The study of a shopping center had several advantages. Both New Brunswick and Somerville are old cities and the character of their development was attuned to the dominant transportation mode of the day. Thus, high density commercial development ensued without the amenities necessary for a highly mobile automobile oriented society. These amenities include abundant parking, easy access on wide streets, and efficient commercial layout. Shopping centers, on the other hand, are distinctly a phenomenon of the automotive age offering these same amenities generally unavailable in older central cities. Further, since shopping centers are almost totally highway oriented and central areas are not, the shopping center would probably be most affected by a highway improvement. Finally, the effects on the shopping center could be easily measured with a minimum of interviews or sample analysis.

Menlo Park is a regional shopping center with a trade area extending about 25 miles or 35 minutes travel time in all directions. The nuclei of the center are large department stores, a grocery store and a number of smaller specialty shops coming to a total of 48 establishments. Including the 48 stores, an office complex, and parking area, the site totals about 70 acres. The center is relatively new having first opened in the late 1950's. Although the center is located on U. S. 1 north of the interchange with I-287, access is provided by four major highways. In addition to U. S. 1 and I-287, other excellent highways nearby include the New Jersey Turnpike and the Garden State Parkway.

Since the sampled establishments were among the first to locate in the center, I-287 was considered a future asset but not a major factor in the immediate location decision. All interviewees considered good accessibility to customers as the primary reason for choosing their location. Although none of the managers could quantify directly changes in business volume associated with the completion of I-287 to U. S. 1, all indicated that the freeway had the effect of considerably expanding their market to the west, including Bound Brook and Somerville, as revealed by new charge accounts and increased circular distribution. The availability of labor increased and with the greater supply of labor, the quality also improved.

### Impact on Tax Revenues

One of the popular arguments heard today is that construction of limited access highways requires the conversion of large areas of ratable land to public and therefore a nontaxable use. While there is no doubt that this argument is true, it is only one side of the coin. In many areas limited access highways have had decidedly beneficial effects. In preceding sections it was seen that I-287 in Middlesex and Somerset counties has been a primary determinant in the location decisions of industrial concerns and residential complexes which, in turn, have generally had a favorable effect on commercial and service enterprises. As industry has located, suitable sites have increased in price paid per acre from about \$1,300 in 1961, to over \$14,000 in 1967. Industrial lot size has averaged almost 30 acres and the average investment in buildings has exceeded \$1,500,000. In the study area, I-287, while requiring ratable land, has generally increased the value of nearby properties (of which about 85 per cent is zoned for industrial use) and has been a significant factor in the decision to make substantial investments in buildings on that property.

Concurrent with industrial development, the demand for dwelling units in the municipalities adjacent to I-287 has shown substantial increases. Between 1960 and 1965, a total of 16,100 dwelling units were authorized in these municipalities with over 47 per cent authorized in 1964 and 1965.

I-287 has already had the effect of expanding the trade area of existing commercial centers. Since sizeable commercial development usually follows the creation of population concentrations, it can probably be expected that as the population of the I-287, I-95 corridor increases, new commercial clusters will develop.

This development--industrial, commercial, and residential--has two very definite effects on the fiscal resources of a municipality. The higher uses of land and land values will cause ratables and revenues to increase while the demands of these developments on the municipality will require that expenditures be increased. Municipal budgets usually include expenditures for such services as government, public safety, streets and roads, sanitation, health and welfare, recreation, education, and other purposes.

Revenues and expenditures of the municipalities in New Jersey on an annual basis have been relatively consistent, with revenues exceeding expenditures by a small amount each year. Table 5-2 shows this for the period 1960 to 1966. During this

Table 5-2

SUMMARY OF EXPENDITURES AND REVENUES OF  
ALL MUNICIPALITIES

New Jersey  
1960-1966

YEAR	EXPENDITURES		REVENUES	
	Amount (thousands)	Per Cent Increase Over Preceding Year	Amount (thousands)	Per Cent Increase Over Preceding Year
1960	\$ 995,771	-	\$1,056,920	-
1961	1,076,252	8.1	1,126,260	6.7
1962	1,166,153	8.4	1,225,774	8.8
1963	1,234,901	5.9	1,306,020	6.5
1964	1,330,647	7.8	1,408,050	7.8
1965	1,425,548	7.1	1,507,810	7.1
1966	1,481,277	3.9	1,569,287	4.1
Average Per Cent Increase	6.9			6.8

SOURCE: Twenty-Fifth and Twenty-Ninth Annual Report of the Division of Local Finance, State of New Jersey 1962 and 1966, "Statements of Financial Condition of Counties and Municipalities," prepared by the Department of Community Affairs, Division of Local Finance.

period revenues and expenditures have increased annually, 6.8 and 6.9 per cent, respectively.

Municipal revenues are derived from several sources including miscellaneous revenues,<sup>(2)</sup> state aid revenues, delinquent tax and lien collections, current tax collections,<sup>(3)</sup> emergency borrowings, plus accumulated surplus revenues.

Table 5-3 compares the municipal tax revenues of both the municipalities in the I-287, I-95 corridor and the municipalities in Middlesex and Somerset counties not in the corridor for the period 1960-1966. During this period, the tax revenues of the municipalities in the corridor increased from \$27,900,000 to \$55,200,000 or 97.9 per cent, an increase of 12.2 per cent annually. Revenues of other municipalities increased from \$67,200,000 to \$106,200,000, or 58.0 per cent. On an annual basis, revenues increased 7.9 per cent. The fluctuation in the annual rate of increase is directly tied to several economic and administrative factors, not the least of which are the vagaries of tax assessment procedures which can vary substantially between municipalities at any point in time.

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(2) Includes cash receipts from licenses, fees and permits, fines, interest and costs on taxes and assessments, bus receipts, parking meters, franchise and gross receipts taxes, etc.

(3) Current tax collections or property taxes levied are the major revenue source of the municipalities.

Table 5-3

SUMMARY OF TAX REVENUES FOR MUNICIPALITIES WITHIN THE I-287,  
 I-95 CORRIDOR AND FOR THE REMAINING MUNICIPALITIES OF  
 MIDDLESEX AND SOMERSET COUNTIES

New Jersey  
 1960-1966

<u>YEAR</u>	TAX REVENUES OF MUNICIPALITIES IN (1) <u>I-287, I-95 CORRIDOR</u>		TAX REVENUES OF MUNICIPALITIES NOT IN <u>I-287, I-95 CORRIDOR</u>	
	<u>Amount</u> (thousands)	<u>Per Cent Increase</u> <u>Over Preceding Year</u>	<u>Amount</u> (thousands)	<u>Per Cent Increase</u> <u>Over Preceding Year</u>
1960	\$ 27,873	-	\$ 67,197	-
1961	33,949	21.8	72,164	7.4
1962	37,777	11.3	78,530	8.8
1963	42,482	12.5	85,037	8.3
1964	47,634	12.1	92,899	9.2
1965	52,149	9.5	99,381	7.0
1966	55,171	5.8	106,190	6.9
Average Per Cent Increase	12.2			7.9

(1) Includes the following municipalities in Middlesex County:  
 Metuchen Borough, Edison Township, South Plainfield Borough, Piscataway Township, Dunellen Borough, Middlesex Borough, Bound Brook Borough, and South Bound Brook Borough; in Somerset County: Franklin Township, Somerville Borough, Bridgewater Township, and Manville Borough.

SOURCE: Annual Report of the Division of Local Finance, State of New Jersey, Statements of Financial Condition of Counties and Municipalities, prepared by the Department of Community Affairs, 1960 through 1966.

Although revenues collected is certainly a meaningful measure of the economic growth of a governmental unit, there are so many different revenue producing items and such variation in assessment rates, tax rates, and timeliness of valuations between municipalities that revenues reveal little about the increases or decreases in taxable property values. Equalized valuation is a measure devised by the Director, Division of Taxation, for the New Jersey Commissioner of Education to aid in the calculation and distribution of state school aid. The purpose is to place all municipalities on equal footing with regard to the true value of real property. Equalized valuations of municipalities within and out of the I-287, I-95 corridor are compared for the period 1960-1966 in Table 5-4. Although both groups of municipalities experienced identical average annual increases, relatively it is interesting to observe the individual annual increases. Prior to 1963, the municipalities outside the I-287, I-95 corridor experienced the higher annual per cent increases. From 1963 to 1966, the municipalities in the corridor have experienced an annually increasing rate exceeded in relative magnitude only in 1965. The rapidly increasing revenues and level of equalized valuations may be considered indicative of the growth of the area and the enhanced financial posture of the municipal governments in the I-287, I-95 corridor.

Table 5-4

SUMMARY OF EQUALIZED VALUATIONS FOR MUNICIPALITIES WITHIN  
THE I-287, I-95 CORRIDOR AND FOR THE REMAINING MUNICI-  
PALITIES OF MIDDLESEX AND SOMERSET COUNTIES

New Jersey  
1960-1966

YEAR	EQUALIZED VALUATIONS OF MUNICIPALITIES IN I-287, I-95 CORRIDOR <sup>(1)</sup>		EQUALIZED VALUATIONS OF MUNICIPALITIES NOT IN I-287, I-95 CORRIDOR	
	Amount (thousands)	Per Cent Increase Over Preceding Year	Amount (thousands)	Per Cent Increase Over Preceding Year
1960 <sup>(2)</sup>	\$ 1,008,838	-	\$ 1,999,768	-
1961	1,062,265	5.3	2,143,665	7.2
1962	1,135,739	6.9	2,301,721	7.4
1963	1,230,572	8.3	2,445,622	6.3
1964	1,340,298	8.9	2,644,269	8.1
1965	1,464,985	9.3	2,925,724	10.6
1966	1,629,966	11.3	3,214,900	9.9
Average Per Cent Increase		8.3		8.3

(1) Includes the following municipalities in Middlesex County:  
Metuchen Borough, Edison Township, South Plainfield Borough, Piscataway Township, Dunellen Borough, Bound Brook Borough, and South Bound Brook Borough; in Somerset County: Franklin Township, Somerville Borough, Bridgewater Township, and Manville Borough.

(2) Estimated.

SOURCE: Annual Report of the Division of Local Finance, State of New Jersey, Statements of Financial Condition of Counties and Municipalities, prepared by the Department of Community Affairs, 1960 through 1966.

Three municipalities which have experienced considerable industrial and residential growth within their borders and are traversed by I-287 include Edison Township, South Plainfield Borough, and Piscataway Township. As an example of this growth, of the 36 establishments participating in the management interview in these municipalities, 23 located in the decade of the 1960's. These figures reveal the considerable impact this growth has had on the equalized value of land and improvements.<sup>(4)</sup> From 1960 to 1967, the equalized value of land in these three municipalities increased 207.0 per cent and the same value for improvements on the land increased 73.8 per cent, a combined increase of 100.0 per cent.

All of the data presented in this section on tax revenues are indicative of the growth currently being experienced in the area and reveal clearly the initial impact I-287 has had in bringing financial vitality to the municipalities it has traversed.

#### Vehicular Benefits

Many of the benefits promulgated by Interstate highways have been cited, analyzed, and discussed. Much of the prior discussion involved changes which have occurred because of highway use, but little has been said about the user and the benefits which he enjoys simply by traveling on limited access facilities.

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(4) These data were taken from the abstract of ratables for Middlesex County, 1960 and 1967.

The phenomenal increase in motor vehicle ownership and use since World War II has necessitated the widespread construction of limited access freeways culminating during the 1960's in the implementation of a substantial portion of the Interstate Highway System.<sup>(5)</sup> These massive investment projects have brought profound advantages, both directly to highway users and indirectly to the community at large.

Direct Benefits - Of particular importance among benefits to Interstate highway users are savings accruing from reduced vehicle operating costs. Higher travel speeds often combined with distance savings contribute time savings and the higher character of service offered by the highways provides increased safety, comfort, and convenience.

Vehicle Operating Cost Savings - User savings have been quantified in monetary terms and shown to be substantial. For example, the following data were developed by A. F. Friedlander in 1965.<sup>(6)</sup>

Cost savings by type of vehicle on the rural Interstate system compared with travel on alternative major rural highways is shown in cents per mile and per cent reduction.

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- (5) In September, 1967, a total of 24,600 miles of the Interstate Highway System, 60 per cent of the total programmed mileage of 41,000 miles, was open to traffic. U. S. Department of Transportation, Highway Statistics, 1966, p. 166.
- (6) A. F. Friedlander, The Interstate Highway System--A Study in Public Investment, North Holland Publishing Company, 1965, p. 40, ff.

	<u>SAVINGS</u> (cents per vehicle-mile)	<u>PER CENT REDUCTION IN COSTS</u>
Automobiles	1.828	8.8
Buses (intercity)	4.518	10.3
Single-unit trucks (medium)	2.595	8.9
Combinations (medium)	3.847	8.5

Benefiting mainly from time savings through disassociation from impedance due to congestion, the user cost savings pertaining to the urban Interstate System are even more substantial. The data below show cost savings in cents per mile and per cent reduction by type of vehicle on the urban Interstate System compared with travel costs on alternative major city streets.

	<u>SAVINGS</u> (cents per vehicle-mile)	<u>PER CENT REDUCTION IN COSTS</u>
Automobiles	4.232	32.1
Buses (transit)	5.340	11.2
Single-unit trucks (medium)	10.586	10.6
Combinations (medium)	13.812	13.8

Accident Savings - The accident rate on limited access highways is at least half that on other roads.<sup>(7)</sup> Owing to inflationary factors causing an upward moving trend in motor vehicle

(7) C. W. Prisk, "Accident Experience on Highways Twenty-seven States," Public Roads, Vol. 29, No. 11, 1957, p.266.

insurance rates, the savings accruing from the reduced probability of accidents brought about by implementation of the Interstate System is unlikely to reflect in reduced insurance premiums.

However, there is a real savings to the community from the viewpoint of a reduction in the direct cost of accidents in the form of losses to persons and to property. These accident savings have been quantified in Department of Transportation studies, and in 1960, were found to be 0.72 cents per vehicle-mile.<sup>(8)</sup> These costs did not include the opportunity cost to persons and vehicles through loss of work. More recent research on accident costs undertaken in the Washington Standard Metropolitan Statistical Area (SMSA) found that accident savings per vehicle-mile on Interstate highways in the study region were 0.44 cents.<sup>(9)</sup>

The same study found that the direct costs of accidents in the Washington SMSA between April 1, 1964, and March 31, 1965, totalled an awesome \$81,870,000. This was equivalent to approximately \$40.00 per person.

In this context, the Interstate highways in the Washington, D. C. area had a salutatory effect on the accident rate. The vehicle-miles of travel on the Interstate highways (principally the

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(8) B. B. Twombley, "The Economic Cost of Traffic Accidents in Relation to the Highway System," Public Roads, 1, No. 2. 1960.

(9) Wilbur Smith and Associates, Motor Vehicle Accident Costs--Washington Metropolitan Area, 1966, p. 50.

Capital Beltway) were 11.5 per cent of all vehicle-miles of travel in the study area. Accident involvements on the Interstate highways were 3.0 per cent of all accidents and the direct costs attributable to these accidents were 4.9 per cent of all costs.

In an analysis of accident data on the Interstate System compiled by 16 states in 1960, the following conclusions were derived: <sup>(10)</sup>

On the average, accident rates on the Interstate System were slightly more than one half those on nearby existing highways, either before or after the Interstate System was opened to traffic.

The accident and injury rates on the existing highways did not change much after the Interstate System was opened and some traffic diverted from these highways to the Interstate System. However, fatality rates on existing highways in rural areas declined by more than one half after opening of the Interstate System.

The more densely populated urban areas had the greatest net reduction in accident and injury rates. Also, the net reduction in injury rates for rural areas followed closely that of the highly urbanized areas. Fatality rates in rural areas were reduced by 71 per cent as compared with 24 per cent for urban areas.

The accident rate generally increased as traffic volume increased; this trend was particularly evident for existing highways.

As expected, head-on, opposite-direction, side-swipes, angle, and pedestrian collisions were nearly eliminated on Interstate highways. About one third of all collisions on these highways were of the rear-end or same direction sideswipe types and nearly all of the remaining accidents involved only a single vehicle.

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(10) S. R. Byington, "Interstate System Accident Research," Public Roads, Volume 32, No. 11, December, 1963, p. 256.

Although control of access is the most important single factor contributing to the excellent safety record of the Interstate System, there is an indication that other elements of modern highway design, such as wide medians, easy curvature and gradient, and long sight distances, are important.

In this connection the severity of accidents on the Interstate Systems could be markedly reduced by the greater provision of guardrails protecting fixed objects. For example, it was found that the cost per accident was reduced from about \$1,580 from collision with an unprotected overpass section to \$840 when the section was protected by a guardrail. (11)

#### Traffic Accidents in New Jersey

In 1965, an estimated 10.5 billion vehicle-miles of travel occurred on New Jersey's 1,951 miles of state highways. There were 49,629 traffic accidents in the same year. The accident rate per 100 million miles of travel was 471. In contrast, the accident rates per 100 million miles of travel on the state's Interstate System ranged from 48 to 105.

These data are presented in Table 5-5. Also shown are the accident statistics for the various highways by level of service classification. It can be seen that the accident rate increases progressively with the number of undivided traffic

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(11) J. A. Cirillo, "Interstate System Accident Research, Study II," Highway Research Record, No. 188, Office of Research and Development, Department of Transportation, 1967, p. 3.

Table 5-5

## NUMBER AND RATE OF HIGHWAY ACCIDENTS

Selected Controlled Access Highways and  
for Principal Highway Classifications  
New Jersey  
1965

<u>SELECTED CONTROLLED ACCESS HIGHWAYS</u>	<u>LENGTH IN MILES</u>	<u>AVERAGE</u>		<u>ACCIDENT RATES</u>	
		<u>DAILY VOLUMES</u>	<u>ANNUAL TRAVEL (100 mvm)</u>	<u>Total (per 100 mvm)</u>	<u>Fatal</u>
Route 78	10.03	18,930	0.693	55	0.00
Route 95	16.01	19,080	1.115	76	0.00
Route 80	23.04	20,810	1.750	93	1.00
Route 295	15.17	29,820	1.651	48	1.00
Route 287	20.83	10,850	0.825	105	2.00
<u>HIGHWAY CLASSIFICATION</u>					
2-Lane	712.88	6,665	17.342	454	5.54
3-Lane	5.67	13,046	0.270	670	3.70
4-Lane	64.26	15,447	3.623	726	6.35
6-Lane	1.75	22,520	0.144	1,326	0.00
Total Divided	487.97	29,951	53.346	376	2.77
Total Variable <sup>(1)</sup>	678.61	12,338	30.560	611	4.97
TOTAL STATE HIGHWAY SYSTEM	1,951.14	14,784	105.285	471	3.99

(1) Change in type of highway within municipality.

SOURCE: Accident Data, Traffic Volumes and Mileage on the State Highway System, 1965,  
Department of Law and Public Safety and the State Highway Department, New Jersey.

lanes. The rate increased from 454 per 100 million vehicle-miles of travel on two-lane highways to 1,326 on the state's 1.7 miles of six-lane undivided highway. In contrast, the rate on the state's 488 miles of divided highway was a more moderate 376. This was still well above the accident rates recorded on the Interstate highways. The rates for fatal accidents on Interstate highways were substantially lower than the state average of 3.99 per 100 million vehicle-miles of travel.

#### Expressways in New Jersey

Expressways and toll roads have played an important role in the development of New Jersey. The New Jersey Turnpike and the Garden State Parkway, conceived in 1948 and 1952, preceded the Interstate System by several years. Although only limited study has been made of the impact of these highways on the areas they traverse, the individual toll authorities were able to provide certain data which indicate the nature, function, and effect the facilities have had on the areas served.

The following describes and characterizes the development and operation of three turnpikes in New Jersey: the New Jersey Turnpike; the Garden State Parkway; and the Atlantic City Expressway.

The New Jersey Turnpike- The New Jersey Turnpike Authority Act in October, 1948, authorized construction of the turnpike to alleviate acute traffic problems which developed in New Jersey after 1945.<sup>(12)</sup> The turnpike opened on January 15, 1952.

The mainline of the turnpike is 117.5 miles and was opened in sections between November, 1951, and January, 1952, and was constructed at a cost of \$277,801,992.

The Newark Bay - Hudson County Extension opened in April and September, 1956. Its 8 miles cost \$115,123,674 to construct.

The Pennsylvania Extension, 6 miles long, opened May, 1956, at a cost of \$21,405,360.

Another \$32,411,626 for additional lanes and service areas brought the total cost of construction to \$446,742,652. To finance the construction, \$446,200,000 of revenue bonds were issued.

In 1952 there were 39 accidents per million vehicles, 2.57 fatalities, and 46.6 injuries. In 1966 these all decreased. Accidents per million vehicles decreased by 33 per cent to 26; fatalities by 86 per cent to 0.46, and injuries by 57 per cent to 20.2.<sup>(13)</sup>

(12) The New Jersey Turnpike, a pamphlet issued by the Authority.  
(13) 1966 Annual Report, The New Jersey Turnpike Authority, p. 17.

Provisions for efficiency and improvement in all driving conditions have continuously been made during the years of the turnpike's operation. Traffic control signals, high intensity lights, protective fencing, and installation of emergency telephones for instant two-way communication are examples of the Authority's continued interest in safety. Thirty garages, 22 fire companies, 36 ambulance squads, and 109 State Police troopers stand ready to attend to problems as they occur. Helicopters with heliports all along the turnpike are great aids in maintaining the operation of the turnpike.

When the turnpike opened, it was estimated that by 1975 the facility would carry 21,500,000 vehicles in that year; this estimate was realized in 1953 when 22,005,078 vehicles traveled the turnpike.<sup>(14)</sup>

On October 4, 1966, the decision to expand the turnpike became a reality with a bond sale of \$179,000,000. This possibility had been studied since 1964 when officials realized the congestion that would come with completed Interstate Routes 95, 287, 78, 80, and 280. Nineteen miles of the turnpike will be widened from 6 to 12 lanes; 6 miles will receive an additional 6 lanes;

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(14) Ibid.

and 5 miles, 4 additional lanes. The features of the widening program will be safer exit ramps, segregation of vehicles, separate roadways, more economical roadways, and grade-separated U-structures. (15)

The widening will require purchase of 800 separate land parcels. Originally, the Authority purchased 5,000 acres from 1,800 lots for more than \$20,000,000. A few examples of changing land values along the turnpike's route follow. Land which sold for \$500 an acre in 1950 now sells for about \$3,500 an acre. Land which was as high as \$35,000 an acre in 1950 has increased more to \$40-45,000 an acre. Land, part of a dairy farm, sold for \$400 an acre in 1950; its value now is about \$12,500 an acre.

East Brunswick typified the significant residential development which occurred along the turnpike. The widening and additions will affect land use along the turnpike.

Areas are planning for the new turnpike additions. The Hackensack Meadows Future Development Plan has incorporated a proposed spur which will begin at Interchange 15 (Newark Airport) pass under the Pulaski Skyway and continue via a high-level structure

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(15) Widening Program, publication of the New Jersey Turnpike Authority.

to an interchange with the proposed Interstate 280 at Kearny.

This spur will aid traffic not going into the Lincoln Tunnel as it will connect primarily with the George Washington Bridge. <sup>(16)</sup>

The Meadowlands planners realized the type and magnitude of impact which the spur could have on their area. Since the turnpike was recently designated as a part of Interstate Route 95, it will possibly guide more traffic into the area than the toll road would have attracted.

The roadway will be elevated at several locations in the Meadowlands to cross over navigable waterways, railroads, and existing highways. This present consideration will allow more flexibility for future planning. <sup>(17)</sup>

Prior to 1960 there were 21 firms which located in the area of The New Jersey Turnpike. In October, 1967, there were 131 firms within 3 to 5 miles of easy access to the turnpike.

Garden State Parkway - Another important link in the New Jersey highway transportation network is the Garden State Parkway, which was conceptually begun in 1945. Limited funds

(16) From interview with Mr. Tani, Director of Public Information, New Jersey Turnpike Authority.

(17) Hackensack Meadows Comprehensive Plan, Technical Report No. 3C, prepared by New Jersey Department of Conservation and Economic Development, p. 3C-18.

and lack of organization delayed construction of the parkway. On April 14, 1952, with the creation of the New Jersey Highway Authority, the parkway's construction began; the first toll section was opened in January, 1954.

The parkway was financed by a \$370,000,000 revenue bond issue; an initial issue of \$285,000,000 was backed by state credit. It follows the coastline of New Jersey for its entire length of 173 miles. Total fare for a trip on the facility is \$2.75.

Its 83 interchanges provide access to and from Jersey shore points and northern metropolitan areas. It connects with Interstate Routes 80 and 287, the New Jersey Turnpike, and the Atlantic City Expressway. The highway is operated by three commissioners, appointed by the Governor for 9-year terms.

"It was expected--and in the early days of the parkway's operating career, it was the case--that traffic would flow south at the beginning of a weekend and in the opposite direction when motorists returned home."<sup>(18)</sup> Conceptually, the roadway was built primarily to carry recreational traffic. However, it has brought about significant effects on the 10 New Jersey counties through which it passes. The parkway has ameliorated some downward

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(18) Summary remarks of D. Louis Tonti at the annual meeting of the International Road Federation, September 22, 1966, London, England, "Toll Roads--A Revolution in Mobility."

economic trends which were affecting the area. A Rutgers University study, 1948 to 1954, found that retail business in the Jersey shore area was declining. The parkway has been regarded as the catalyst which reversed the trend.

In the first 3 years of its operation the parkway carried an economic impact into the 10 counties it traverses. This impact, measured in ratables and retail business, was \$1,680,290,843. The increase was twice that of the 11 other New Jersey counties.<sup>(19)</sup>

Occurrences in Monmouth County exemplify the type and magnitude of impact which the parkway brought. From 1950 to 1958 its population increased by 52.5 per cent. The increases were found to be greatest in Matawan Borough and Township, Raritan Township, and Middletown Township which are nearest the parkway. The Monmouth County Planning Board believes the growth to be a direct result of accessibility provided by this facility.

"Principally, it follows the parkway. Developments are springing up in clusters around the interchanges, as earlier growth followed the railroad stations along the shore."<sup>(20)</sup>

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(19) Katherine E. White of the New Jersey Highway Authority, "Economic Effects of a Superhighway," October 17, 1958.

(20) Jack McCarthy, "Jersey's Bounce: Parkway Spurs Increase in Monmouth Population," Newark, New Jersey News, March 3, 1960.

Cars congregate at the interchanges as they serve as points of origin for carpools which travel the parkway to work.

The Board found that scarcity of land nearer to metropolitan areas was causing their people to seek suburban or rural residences. In 1955 and 1956, many new homes in the \$15,000 to \$25,000 range were built; dwelling units for 63,066 families were provided in 9 counties traversed by the parkway. <sup>(21)</sup>

Scarcity of land near metropolitan areas has pushed industry into the outer fringe. Existing plant obsolescence and the desirability and efficiency of one-story operation are among the reasons industry has moved. <sup>(22)</sup>

As labor and industry have located in Monmouth County, new recreational facilities have developed as have many new shopping centers. In order that growth be orderly, township governments have encouraged strict enforcement of zoning ordinances. <sup>(23)</sup>

Ocean County along the southern shore also received favorable impact from the parkway. It had experienced declining economic activity. The highway made for easier accessibility to

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(21) Katherine White, op.cit.

(22) McCarthy, op.cit.

(23) Ibid.

the metropolitan area. People who had previously been occasional visitors were able to establish permanent residences in the county. (24)

A unique feature of this highway is the Garden State Arts Center, which is presently under construction and will open early in 1968. It is being built by the New Jersey Highway Authority as a home for the creative and performing arts. Located in Monmouth County, 30 miles south of Newark, the center will be a part of the 350-acre Telegraph Hill Park.

The center will offer an amphitheater, art exhibition mall, nature trails, and refreshment and restroom facilities. There will be parking areas for 2,000 cars. The center will provide seating room for 5,000 inside and 5,000 outside.

Later stages of the center's development will be a theater for drama, botanical gardens, a mirror pool, a figure-skating rink, and a nearby ski slope.

The center should encourage even more tourists to use the parkway which now provides convenient and ready access to multitudinous recreational facilities.

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(24) "New Jersey Population Rises a Million in 7 Years to 7 Million," Courier-News, Plainfield, New Jersey, November 14, 1967.

Atlantic City Expressway - The New Jersey Expressway

Authority was established in the State Highway Department in 1962 by an act of the same name.<sup>(25)</sup> The Authority handled construction of the Atlantic City Expressway which opened 37 of its 44-mile length in July, 1964, and the remainder in July, 1965. The expressway serves as a direct link between metropolitan Philadelphia and Ocean, Atlantic, and Cape May counties, which are on New Jersey's southern shore. The trip used to take 2.5 hours; it now takes only 72 minutes. It connects with the Garden State Parkway to provide direct access to the New York Thruway and New England to the north and the Cape May-Lewes Ferry to the south. Construction of the expressway was paid for by \$52,625,000 revenue bonds. It required purchase of 680 land parcels as right-of-way.

The slogan of the expressway is "Shortest Short Cut to the Shore" and indicates the recreational use made of the road. Review of monthly toll revenues has revealed the seasonality of the highway's use. In 1966, 65.4 per cent of toll revenues for the year were collected from June to September. During July and August of that year, 43.7 per cent of toll revenues were collected.

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(25) 1965 and 1966 Annual Reports, New Jersey Expressway Authority.

Emergency call boxes are located a mile apart along the entire route. A trooper monitors calls 24 hours a day so that help always is near. The expressway employs over 100 people with an annual payroll of about \$500,000. In addition the State Police are paid \$228,000 yearly for patrolling the road. (26)

Besides its own contribution to the area's economy, the expressway has caused much new investment in the area. Since it opened 2 years ago, the expressway exit at Atlantic City has had new construction of hotels, motels, and stores valued at \$16,250,000.

The Litzie Construction Company has planned a 6-store complex and a 12-story, 500-unit motel near this exit.

The Statler-Hilton chain plans to build a \$5,000,000, 20-story hotel at the foot of the expressway where already there are: a \$5,000,000 Holiday Inn; \$2,500,000 Howard Johnson Motor Lodge; and, the \$1,000,000 Four Seasons Hotel. (27)

Over \$25,000,000 of new capital investments has been made by business enterprise in the vicinity of the expressway since it opened. Johns-Manville, RCA, Gustin Bacon, M & R Refractory Metals, Masonite Corporation, Bellmawr Industries, Inc.,

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(26) Mr. Scanlan, Executive Director of the Expressway.

(27) "The Atlantic City Expressway," release of November 9, 1967.

Superior Scale Company, and Cutler Metal are among firms which have moved here.

More than 2,000 jobs have been created in these industries with a combined payroll of over \$12,000,000. At the accepted "turnover rate" of five times payroll, this means \$60,000,000 to Atlantic County annually.

The Southern New Jersey Industrial Development Council is working to develop an industrial park in Winslow Township. The site was determined because of the expressway. (28)

The home builders industry reports an increase in housing developments since the expressway opened.

The future growth of expressway traffic will be associated with the industrial, commercial, residential, and recreational growth of the six-county southern New Jersey area which it services.

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(28) Mr. Scanlan, op. cit.

### Highway Impact Findings of Other Studies

The nature, size, and composition of the nation's output, the industrial structure within which it is produced, and the distribution of the corresponding income flows (geographically and among the nation's families) are all dependent in some measure upon transportation facilities: their present location, their adequacy, and their availability.<sup>(29)</sup>

Transportation facilities have long been recognized as forming necessary and important links in our economy and highway transportation systems have been considered the most vital of all modes. Their impact on the economy--local, regional, national--have been studied for many years.

A 1916 report, Economic Surveys of County Highway Improvement, had this to say about highway improvements.<sup>(30)</sup>

Many claims and counterclaims are made as to the propriety of expending large sums of money for public-road construction in local communities. One set of extremists ascribe to good roads nearly all the benefits and blessings which fall to the lot of humanity, while another set sees in large outlays for road construction only the specter of debt and ruinous taxation. Somewhere between these two extremes must be placed the actual result produced.

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(29) Highways and Economic and Social Changes, U.S. Department of Commerce, Bureau of Public Roads, 1964, p. 1.

(30) Economic Surveys of County Highway Improvement, U.S. Department of Agriculture, Bulletin No. 393, Government Printing Office, Washington, D. C., 1916, p. 2.

The report included an evaluation of the economic benefits accruing to the eight counties included in the study.

In arriving at an estimate of the benefits which a county receives through the improvement of its public roads, certain factors must be taken into account more as the media by which the benefits may be measured than as the actual benefits themselves. While it is realized that the increase in the value of land must not be added to the saving in hauling costs, the convenience and access to schools, markets, churches, etc., but is rather the effect produced by those causes, it is perhaps the best index which can be obtained as to the economic value of the roads to the community. A study of the increase in the values of farm lands in the eight counties reveals the rather interesting fact that following the improvement of the main market roads the increase in the selling price of tillable farm lands served by the roads has amounted to from one to three times the total cost of the improvements. The increase in values in those instances which were recorded ranged from 63 per cent to 80 per cent in Spotsylvania (Virginia), from 68 to 194 in Dinwiddie (Virginia), 70 to 80 in Lee (Virginia), 25 to 100 in Wise (Virginia), 9 to 114 in Franklin (New York), 50 to 100 in Dallas (Alabama), 25 to 50 in Lauderdale (Mississippi), and from 50 to 100 in Manatee (Florida). . . . Considering the eight counties in the aggregate, the gross annual saving in hauling costs due to their good-roads systems affords the rather impressive total of \$627,409 for a traffic of 3,489,652 ton-miles. The average gross saving per ton-mile for the eight counties is 17.8 cents, this being indicated by an average rate of 33.5 cents before the roads were improved, as compared with 15.7 cents after the roads were improved. (31)

Now, with the construction of the Interstate System, the United States is being provided with a network of freeways which will

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(31) Ibid.

effectively link all of its regions together. The economic impact of this system will be enormous.

#### Indirect Benefits

The benefits accruing from the Interstate System are not confined to users. Highway travel is not only directly beneficial to highway users but is also of intermediate benefit in the shipment of commodities. Thus, the Interstate System may be expected to affect all price structures by reducing the shipping costs of goods transported by truck. This reduction in costs may not be transferred to consumers, but it is possible that it would tend to dampen the rising rate of price increases.

Additionally, the Interstate System has brought benefits in the form of externalities. In particular, the improved highways have widened markets, stimulated investment in industrial development, increased the productivity of land through increasing its accessibility, and has, consequently, affected land values. Also, reflecting through system effects, Interstate highways have made possible reductions in vehicle operating costs to drivers on other highways through reducing traffic impedance, providing travel time savings, and in many instances, reducing the number and severity of accidents.

The increased mobility provided by the Interstate System has stimulated employment opportunities which have, in turn, elevated living standards through increased incomes. Recreational opportunities have also been enhanced. This system has brought many tourist attractions and activities within range of the weekend motorist. Further, the high preference for automobile usage by vacationers has been both encouraged and facilitated by the increased accessibility and convenience provided by these highways. (32)

#### Change in Land Use and Land Values

Changes in land use or land-use potential and land value changes are virtually synonymous. The extent to which change occurs depends on existing use, location, and accessibility. Urban freeways when they traverse relatively undeveloped land may have profound effects on land use and value because of the highway. On the other hand, if the freeway traverses densely developed urban areas, less pronounced changes are apt to occur. Suburban freeways often traverse undeveloped land and often affect the direction and nature of suburban growth.

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(32) The report of the Outdoor Recreation Resources Review Commission (O.R.R.C.) estimated that 82 per cent of adult Americans used their own automobiles for recreation trips, O.R.R.C. #20, 1964, p. 44.

In several instances, urban expressways have been shown to have a significant influence on the redevelopment of the central area. For example, expressways to the central area of San Francisco were credited with stimulating \$189,000,000 in office, government, and hotel construction in the 3-year period, 1956 to 1958.<sup>(33)</sup> More recently in Boston, much of the success of the Prudential Center was the result of an extension of the Massachusetts Turnpike which serves the center through underground exits. The extent of the Prudential Center investment was about \$150,000,000. In addition to the construction of the Prudential Center, other development was stimulated.<sup>(34)</sup>

Although right-of-way and land requirements for these developments are costly, the increase in land values often helps offset the loss in taxes caused by the removal of taxable land from the tax rolls. It is expected that the increase in land values caused by an expressway in Houston will yield enough tax revenues in 7 years to cover the city's cost for right-of-way.<sup>(35)</sup> The Prudential Center in Boston is expected to yield about \$3,000,000 a year in taxes compared to \$449,000 the site yielded the city in 1957.<sup>(36)</sup>

(33) Impact of Improved Highways on the Economy of the United States, Stanford Research Institute, December, 1958, pp. 108-109.

(34) Urban Land, Urban Land Institute, Volume 24, Number 10, November, 1965, p. 3.

(35) Stanford Research Institute, op. cit.

(36) Urban Land, op. cit.

Similar effects have been observed in New Jersey. The Atlantic City Expressway, as mentioned previously, has stimulated substantial investment in Atlantic City near the city terminus. The construction of Interstate Highways 80, 280, 78, and 278 into high density urban areas of New Jersey could stimulate additional development and redevelopment. There are few areas of urban northeastern New Jersey which could be considered undeveloped, with the exception of the Hackensack Meadows. It is believed that the addition to the New Jersey Turnpike will stimulate additional investment in this area.

Freeways probably have had their greatest impact in suburban or urban fringe areas. The effect on land values of a suburban freeway has been graphically demonstrated in Chapter 3 of this report. Prior to construction of I-287, this land was either vacant or subjected to low-level agricultural use. Changes in use and use potential have had the greatest effect on prices. Other studies have shown that the most substantial increases in land values have occurred concurrent with changes in land use as opposed to increased efficiency of the present use.

Changes in land use in suburban areas have been documented in many studies. A study made of several expressways in metropolitan areas in Texas found that the transportation facilities influenced land-use patterns by creating a hierarchy of

uses. Industrial uses occurred in the areas of greatest accessibility with commercial and residential uses developing on remaining sites. (37)

Similar results were observed in a study of Massachusetts Route 128, a limited-access circumferential freeway approximately 10 miles from Boston's center. The freeway encouraged many new industries to locate along its 57-mile length. Too, it caused industries in Boston's central city to relocate. Route 128 was a channel for industrial development in those towns through which it passed.

The location of research and development firms and light industries in industrial parks helped the towns along the route to maintain pleasant residential features. Many people moved into the suburban areas which were developed along the facility. It was found that residential land values and population densities were greatest adjacent to the facility. (38)

The Capital Beltway is a circumferential freeway which is located in the Washington metropolitan area. The development of land use and values along its route has been unique in that

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(37) W. G. Adkins, Land Value Impacts of Expressways in Dallas, Houston, and San Antonio, Texas, Bureau of Business and Economic Research, University of California, Los Angeles, 1964.

(38) A. J. Bone, et. al., Economic Impact Study of Massachusetts Route 128, M.I.T., Cambridge, Massachusetts, 1958.

it is permeated with federal government activity. Government installations, which in many cases were "squeezed" from Washington's central district, have benefited from increased accessibility and larger land tracts afforded them by a Beltway location. Because they have relocated near the Beltway, they have drawn some complementary private entrepreneurial activity with them. Types of private industrial companies seeking prime freeway locations in the future will be distribution firms, electronic manufacturers, and research and development firms. It is believed that high land prices along the Beltway will discourage general manufacturing and service industries from location there.

There is evidence that commercial and high-density residential uses have replaced previous, lower land uses. There has been dramatic impact in the expansion of apartment complexes in the Beltway's vicinity in northern Virginia, a suburban area of Washington, D.C. The Beltway, completed in 1964, is too new for any quantitative measures to have been made. However, there is evidence that land values have increased everywhere along the corridor.<sup>(39)</sup>

In almost all impact cases, land adjacent and most accessible to a new facility has reoriented uses and increased land values. Of particular interest is the development around interchanges on a new facility.

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(39) Maryland Capital Beltway Impact Study, (Final Report), Wilbur Smith and Associates, 1968.

The Colorado Highway Department found in a study of effects on the economy of areas near Interstate Route 25, southeast of Denver, that higher land values applied particularly to an area approximately 1.5 miles west of the study highway. In one case, the value of a parcel increased so sharply that the last owner paid 64 times that price paid by the state for the right-of-way. Activity in several parcels realized increases in value of over 2,000 per cent. The study found that land adjacent to interchanges experienced considerable transfers in use. (40)

A study of the portion of Interstate Route 25, north of Denver, showed similar changes in land value. The route provided access enabling the city to grow rapidly in a northerly direction. (41)

In summary, individuals owning property near interchanges can generally expect increasing land values from newly created commercial possibilities. The extent of increase is dependent on the distance and direction the land is from the highway and the traffic volume present. Around the Ohio Turnpike Interchanges some choice commercial sites were sold for \$60,000 per acre. (42)

(40) Colorado Land Economic Study: Interstate 25 Southeast of Denver, Colorado Department of Highways, 1962.

(41) Colorado Land Economic Study: Interstate 25 North of Denver, Colorado Department of Highways, 1963.

(42) Land Economic Studies in the State of Ohio: The Western Half of the Ohio Turnpike, Ohio Department of Highways, 1962.

The Michigan State Highway Department devoted 3.5 years of study to Interstate Route 94, which extends from the Indiana state line at New Buffalo to U.S. 23 near Ann Arbor. It is interesting to note the finite results of categorized interchange development. The department found that all major city interchanges developed high commercial values; almost 80 per cent of the major city interchange quadrants had some form of commercial development.

At secondary city interchanges, 40 per cent of the quadrants were put to commercial use. Almost every small town interchange is likely to have some commercial development, although rural interchanges are slow to show this development. (43)

The Department of Commerce recently synthesized a substantial number of cases concerning highway development. There were 900 interchange cases where land showed increases of from 500 to 1,000 per cent in value. These gains greatly exceeded values which came about in the 1,400 noninterchange cases. (44)

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(43) Interchange Development Along 180 Miles of I-94, Michigan State Highway Department.

(44) Bridging the Gap Between Land Economic Studies and Their Application, Office of Research and Development, Economic Requirements Division, U.S. Department of Commerce, June 7, 1966.

It may be concluded that freeways, particularly those through undeveloped land in urban or suburban areas, stimulate changes in land use and land values. Most changes in land value are the result of land-use changes or increased land-use potential. Urban freeways have resulted in significant downtown redevelopment such as has occurred in San Francisco and Boston. Changes in land values can significantly benefit the fiscal status of nearby municipalities in spite of large right-of-way requirements.

Suburban freeways in addition to influencing residential patterns have spurred the development of business and shopping centers easily accessible to a mobile, automobile oriented populous. Accessibility is the primary characteristic of freeways which has and will influence these changes.

#### Effect on Business

As population has migrated to the suburbs and become increasingly automobile oriented, suburban business opportunities usually in the form of shopping centers have increased. Shopping centers are the outgrowth of suburbanization and mobility and are almost totally dependent on highway transportation systems. It has been stated that every well located shopping center is at the focal point of a system of radiating automobile arteries.<sup>(45)</sup>

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(45) Stanford Research Institute, op. cit., p. 154.

The number of shopping centers in New Jersey increased by about 25 centers per year from 1963 to 1967. In 1963 there were 190 shopping centers and in 1967 there were 292, a 53.7 per cent increase in 4 years. Major shopping centers in New Jersey include the Cherry Hill Shopping Center in Cherry Hill, Menlo Park Shopping Center in Edison, Moorestown Mall in Moorestown, Garden State Plaza in Paramus, Pennsauken Shopping Center in Pennsauken, and the Searstown Atlantic County Shopping Center in Pleasantville. Investment per center ranged from \$20,000,000 to \$42,000,000. Centers of this magnitude require from 50 to 100 or more acres, provide parking for 5,000 to 10,000 cars, and usually include from 50 to 150 stores. (46)

This type of development is not only indicative of New Jersey's economic growth and well being, but also of the effect of the highway transportation system on suburban commercial investment.

Of course, suburban shopping center development has had certain detrimental effects on the retail marketing structure of downtown areas. This is causing a reorientation of downtown areas. For example, although there is some relative decline in urban retail activity, central cities are still strong in most specialty retailing. Central city sites are often preferred by general

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(46) As listed in Shopping Center Directory, The National Research Bureau, Incorporated, Vols. VI and IX, 1963 and 1967.

purpose office complexes and apartment house developments. In fact, some investors believe there will be a greater amount of recentralization than in the past due to the increasing costs of decentralization and the advantages of redevelopment at relatively high density.(47)

#### Effect on Bypassed Communities

Freeways are often designed to augment or replace existing highways which have reached or exceeded practicable capacity. These existing highways usually provided unlimited access and as a result experienced substantial commercial development along the right-of-way particularly in the vicinity of towns along the route. Freeways, on the other hand, are limited access and usually bypass existing development for social as well as economic reasons. Because of this characteristic, it is often feared that freeways will be injurious to the existing business climate of the town. This area of impact has been studied although not so extensively as the areas of land use and land value changes.

Economic effects of the highway on bypassed communities have been found to depend on several factors. An important factor is the state of the local and regional economy. In an area of

(47) Investors and Downtown Real Estate--Opinion and Comment,  
Urban Land Institute, Technical Bulletin 39, November, 1960.

economic vitality, the potentially harmful effects of a bypass are quickly overcome by continued growth. However, in areas experiencing little economic growth, the effect on individual businesses, in particular businesses oriented to highway travelers, often have been injurious. In other cases, it has been found that many of the businesses which might have been expected to suffer severe declines in business volume actually had a sizeable local trading population which maintained the viability of the establishment. (48)

In some studies, a rather remarkable finding resulted. In cases where the highway was also the community's main street, through traffic so congested central business areas that the construction and subsequent utilization of a bypass by through travelers actually benefited the town's economy as revealed through increased sales taxes and other business indicators. In other studies, bypasses have been shown to have little or no effect on local retail economies. (49)

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(48) Stanford Research Institute, op. cit., p. 148.

(49) Economic and Social Effects of Highway Improvements, Michigan State University, Highway Traffic Safety Center and Michigan State Highway Department, East Lansing, Michigan, 1961, pp. 54 and 63.

Another factor which has been found a significant determinant of bypass impact is the location of the highway relative to the location of the area bypassed. In a situation where the highway is well removed and beyond easy access to the city, highway oriented business tended to be more adversely affected than when the highway was nearby and access was easily attained.<sup>(50)</sup>

Another rather obvious change can occur which in terms of the total area economy can mitigate any deleterious bypass effects. This is the development of businesses near the interchanges of the new facility. Such development potential often stimulates investment and increases local income and employment. Such development can take place without resulting in the congestion which had plagued the downtown area in the past.<sup>(51)</sup>

There are cases recorded where an expressway while bypassing many towns has stimulated travel throughout a region and thereby caused significant increases in local and regional business. A classic example of this occurred in New Jersey with completion of the Garden State Parkway. Prior to the completion of the Parkway, a Rutgers University study showed that the resort business of New Jersey was suffering serious declines. However, upon completion

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(50) Stanford Research Institute, op. cit., p. 149.

(51) Ibid., p. 147.

of the Parkway, not only the resort business but all type of investment were stimulated simply because of the access provided by the facility. In a study presented in 1959, this impact, measured in terms of ratables and retail business, was calculated to be \$1,680,290,843. (52)

These, of course, have not been the only impacts recorded, but they do provide an insight into the nature and characteristics of freeway benefits or lack of them.

#### Impact on Recreational Activity

Much of the impact resulting from the completion of the Garden State Parkway resulted from the latent demands of the citizens of New Jersey and other states for recreational outlets. Year after year, the nation's employed are enjoying increased leisure time, increased disposable income, and greater mobility through multiple car ownership. As a result, the demand for good recreational facilities is constantly increasing.

Highways particularly Interstate highways and other freeways have the effect of expanding the recreation horizons of the population through easy accessibility to distant attractions. This

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(52) D. Louis Tonti, Traffic Quarterly, April, 1959, p. 198.

accessibility in turn has spurred recreation investment which in turn affects many segments of the economy. In fact, in many states tourism is among the leading industries.

The importance of highways to recreational pursuits is stressed by the fact that 89 per cent of the person travel for recreational purposes is made by automobile. Of all recreation trips, 54 per cent are for distances exceeding 100 miles and 52 per cent are for durations exceeding 1 day. In 1963, a total of \$22,703,000,000 was spent on recreational items for personal consumption. It is interesting that next to walking for pleasure, driving for pleasure is the nation's largest recreational pursuit. (53)

There are many examples of limited access highways improving access to recreational or vacation attractions. Ligonier, Pennsylvania, one of the state's most popular resort areas, was bypassed by the Pennsylvania Turnpike, and it was feared that the town's recreation industry would decline in importance. The opposite effect actually occurred. Bedford, Pennsylvania, another community with a large tourist industry, has found that with completion of the turnpike, about 75 per cent of its tourist business

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(53) Statistical Abstract of the United States, 1965, United States Department of Commerce, pp. 206 and 208.

came from turnpike travelers. The Massachusetts Turnpike is an example of a highway providing access not only to individual tourist attractions but to a region.<sup>(54)</sup>

The National System of Interstate and Defense Highways will in effect provide the nation's recreation traveler with an integrated system of highways providing access to virtually all of our recreation facilities. It has been found in limited area studies that freeway use for recreational travel is a function of distance traveled.<sup>(55)</sup> This finding will undoubtedly become more pronounced as the Interstate System nears completion.

In effect, this means that recreation travelers can reach their destinations quicker, more easily, cheaper, and with a higher degree of travel safety and have a wider choice of destinations. This will stimulate recreation investment, employment, and income.

New Jersey has already recognized this demand through both the Garden State Parkway and the Atlantic Expressway. In addition, the Interstate System will provide convenient access to many of New Jersey's state parks, recreation areas, and tourist attractions.

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(54) Highways and Economic and Social Changes, United States Department of Commerce, Bureau of Public Roads, 1964, pp. 156 and 157.

(55) Maryland Capital Beltway Impact Study, op. cit., p. 5-7.

For example, I-78 will provide a direct route to the Spruce Run and Round Valley Reservoirs in Hunterdon County, and I-95 will make the winter-time resorts of the South more convenient.

### Public Activities

Interstate highways have had an important influence on the nature, location, size, and scope of public and institutional activity. As the accessibility provided by these highways has influenced private sector investment and development patterns, so has investment in the public sector. The degree of this influence has, of course, been directly related to the functional quality of existing facilities, the areas and temporal status of public activity, and the public demand for new facilities.

One of the most important areas of public activity today and one of the raisons d'etre of the Interstate System is its role in national defense. In peacetime or wartime, the military function of these roads is mobility. The ability to move men and materials from one point to another; the decentralization and dispersion of military facilities, private industry and population are among the defensive objectives of the system. (56)

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(56) Stanford Research Institute, op. cit., pp. 195 and 196.

Aside from the national defense, Interstate highways have been important in influencing public investment both nationally and locally. The Capital Beltway, circumscribing Washington, D.C., is probably the most notable example. Many of Washington's military and governmental establishments are functional as opposed to administrative, are research, service, or activity oriented, and have land requirements which could not be met in Washington, D.C. As a result, much of this activity was located in suburban areas and largely as a result of the Beltway and its needs, several of these facilities have relocated at sites proximate to the Beltway. Notable among these would be the Atomic Energy Commission and the National Bureau of Standards. The Beltway has been recognized as providing improved access, not only to employees, but also among the various installations within the areas. Among the other public institutions served by the Beltway are educational facilities and hospitals.<sup>(57)</sup>

There are a multitude of examples of public institutions in New Jersey being served by the state's freeways. Middlesex County College, although located in the Raritan

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(57) Maryland Capital Beltway Impact Study, op. cit., p. 5-7.

Arsenal in the eastern portion of the county, is provided access to much of the county interior with I-287. Rutgers University is readily accessible from both I-287 and the New Jersey Turnpike via State Route 18. The reformatories near Clinton in Hunterdon County will be easily accessible from I-78.

Newark airport will be well served by freeways and toll facilities alike. In total, most of New Jersey's public facilities--government, education, medical, transport, and recreation--will be within easy access of the state's population via freeways.



## Chapter 6

### FINDINGS AND CONCLUSIONS

Limited access highways in New Jersey have indeed been beneficial to the state. In part because of the highway transportation system, New Jersey is today one of the most heavily industrialized and fastest growing states in the nation.

The primary area of study has been the I-287, I-95 corridor in Middlesex and Somerset counties. On the fringe of the New York-Northeastern New Jersey Standard Consolidated Area, these two counties are currently experiencing rapid growth in population, employment, and industrialization. Obsolescence of existing plant facilities and increasing costs in more densely populated areas have caused many industries to seek new locations and more efficient plant facilities. Growing industries are looking for similar locations for the establishment of new branch facilities.

Increasing population and population densities as well as improved living standards and suburban job opportunities have been largely responsible for the migration of population from the cities to suburban locations. As suburban population and employment have increased, commercial and service enterprises have been established to meet service demands.

Since Middlesex and Somerset counties have been participating in this migration of industry, population, and business in recent years, this study has considered the effect of a new highway on the socioeconomic characteristics of the area it traverses. Although I-287 is a relatively new facility, many important changes have followed its construction and may be related to its existence. These changes are briefly reiterated below.

#### Industry

Management representatives from 59 firms were interviewed. These interviewees represented manufacturing, distribution and trade, research and development, and transportation firms.

Each interviewee was asked to list the most important factors responsible for the selection of their present site. Four reasons accounting for 69.0 per cent of the responses were given as primary determinants of location. In order, they were

1. Proximity to I-287,
2. Availability of large land parcels,
3. Price of land, and
4. Accessibility of customers.

I-287 did not become a significant site selection factor until 1961. From 1961 to 1967, 32 of the firms sampled had located in the I-287, I-95 corridor, and 25 of these considered I-287 a significant site selection factor.

From the action of these firms, it was concluded that the disadvantages of limited accessibility to I-287 were considered secondary to the more important regional access provided by the facility.

A comparison of employment before and after relocation was made and revealed that, concurrent with relocation, the total number employed increased 12.9 per cent. Furthermore, if one firm which reduced its staff upon relocation was excluded from the sample, total employment would have increased 24.5 per cent. Employment at new or new branch establishments was, in effect, a total gain for the area. Since many of the firms relocated within the region with a concurrent increase in employment, gains in employment, both in relocating firms and in new firms, can be considered beneficial to the region.

Over two thirds of the firm representatives indicated that I-287 had improved employee commuting conditions. Related to improved accessibility, a similar proportion of interviewees responded that I-287 had expanded or improved their potential labor market.

Although there was some difficulty in obtaining investment data from the firm managers, the data which were collected revealed some very interesting investment characteristics. Average acreage purchased per firm was almost 30 acres with an

average price per acre of \$6,400. The highest investment per acre was made by distribution and trade firms, while the largest total land investment was made by research and development firms.

There are many factors which affect land values; they include government policy, accessibility, supply of sites meeting certain criteria, visibility, and demand. In the I-287, I-95 corridor, price per acre for industrial sites has tended to increase at an annual rate of 73.2 per cent. However, in the last year, 1967, prices declined 12.8 per cent as less advantageous sites were developed. As new industries develop and more sites become suitable and are developed, prices should continue to increase. Also, as I-287 is ultimately completed, the entire corridor traversed will undoubtedly show substantial increases in land values.

Calculated investment per square foot of building area varied from \$12.26 for manufacturing firms to \$20.86 for research and development firms. From these averages, a very rough estimate can be generated of the total building investment of firms locating since 1960. This estimate amounts to almost \$48,000,000. Firms indicating that I-287 was a significant site selection factor accounted for 60.5 per cent of this amount or better than \$28,000,000.

It was observed that in each successive time period, the requirement for adjacent rail facilities has become less pronounced.

Less than one third of the manufacturing plants which located during the period 1961-1967 had a rail siding, the lowest proportion in any time period. Similar patterns were recorded for the other types of firms.

Little change in mode of goods transport was reported by the sampled establishments, although several interviewees indicated that considerable changes would probably occur upon completion of the Interstate System. Among all firms reporting use of rail facilities, there appeared to be a consistent but low level of rail utilization, averaging slightly over 14 per cent. The availability of both rail and truck transport allows firms to use that mode of transport which best meets their cost and time requirements. No firms in the I-287, I-95 corridor are today dependent exclusively on railroads for the movement of inputs or finished products. Approximately 70 per cent of the firms sampled are dependent solely on trucks for the movement of both categories of goods. This is particularly true for those firms which have located in the area since 1960.

A major consideration of efficient truck utilization is the availability of high-speed, controlled-access highways with minimal gradient and curvature such as that provided by I-287. In all cases, transportation firms recognized the importance of utilization of I-287 as did 75 per cent or more of the manufacturing

and distribution and trade concerns. This was manifested in routing changes which have resulted in increased delivery speeds or, conversely, reduced delivery time.

A practice of firms locating in the I-287, I-95 corridor is to purchase sites adequate for foreseeable future needs as indicated by almost 80 per cent of the firms surveyed. Twenty-two firms had expansion planned for the near future, and 17 of these planned to expand their facilities at their present site. Of the remaining five firms, four planned new locations in either Middlesex or Somerset County. Since 77 per cent of the expanding firms have located in the I-287, I-95 corridor since 1960, it may be concluded that the firms which have recently located are fast growing concerns and will be major factors in the state's economic growth.

#### Impact on Work Trips

Since most of the establishments were located in industrial districts, zones, or parks generally beyond walking distance of residential areas and outside areas with bus service, most employees traveled to work by automobile. Workers using bus or train or who walked to work accounted for slightly more than 3 per cent of all employees. However, since many of the train and bus users also used autos for the final portion of their work trips, over 98 per cent of all trips were made by auto.

Average automobile occupancy per firm varied from 1.00 to 1.39. The average for all establishments was 1.08, and 10 firms had occupancies of 1.00. The six firms with occupancy ratios above 1.15 persons had all recently relocated from the Newark-New York City area and had retained a sizeable portion of their personnel. Automobile occupancy did not vary consistently with size of firm in terms of employment or with location of establishment. However, it was noticed that occupancy varied with average auto travel time. As travel time increased, occupancy also tended to increase.

The distribution of firms by average automobile travel time was bimodal at 18 to 22 minutes and 28 to 32 minutes. Location in the I-287, I-95 corridor and location date appeared to be determinants of the differences in work trip travel times. Most of the firms in the lower time group were proximate to labor and had located prior to the opening of I-287. Firms in the 28 to 32-minute time group may be considered as the antithesis of firms in the lower time group. Most of the firms in this travel time group were newer and had located in areas more removed from existing population concentrations.

This analysis of travel times points to the importance that firms place on employee accessibility or accessibility to labor force. Older firms gravitated toward population concentrations

more so than newer firms in order to assure accessibility to a large proportion of their labor force.

The mean work-trip duration for all employees was 22.4 minutes, while that for I-287 users was 28.4 minutes and for non-users, 18.8 minutes. The longer the trip, the higher was the probability of I-287 use.

On a per firm basis, the proportion of employees using I-287 on work trips ranged from 17.6 to 88.1 per cent. The average age of establishments with less than 40.6 per cent of their employees using I-287 for work trips was 16.4 years, while the average age for the remaining establishments was 3.4 years.

The average distances traveled on I-287 for trips to and from work were 5.8 and 5.7 miles, respectively. The difference might be accounted for by the use of different directional interchanges and because some employees took different routes home or did not go directly to their residence.

With the exception of Middlesex and Somerset counties, the major residences of employees were Union, Morris, Monmouth, Essex, and Hunterdon counties.

The most fundamental influence on the use of I-287 at any establishment was the relative location of employee residence

with respect to the highway and the establishment's location. In general, the pattern of zones by use or nonuse of I-287 followed the existing highway network and probably represented shortest routing time. The east, southeast, northeast, and northwest seemed to be well served by I-287. Employees living in areas generally perpendicular to I-287 tended to use direct perpendicular routes. Most employees who made extensive lateral movements tended to adjust their commuting patterns to take advantage of the convenience afforded by I-287.

Of the 2,519 employees at firms which had located in the I-287, I-95 corridor since 1960, 20.2 per cent, or 509, had moved since becoming employed by these firms. The areas representing the most intensive residential relocations straddled I-287 or areas made accessible to it by highways. Areas of less intensive relocation were generally just outside the immediate corridor municipalities indicating that persons were inclined to move to locations within relatively short commuting time to work. Of those who moved, 46.0 per cent used I-287 on part of their work trip. Prior to moving, only 41.8 per cent used I-287. This would seem to indicate that a significant percentage of those who moved chose locations where I-287 provided access to work and that this proportion was greater than the proportion using I-287 before relocation.

Chapters 3 and 4 indicate that I-287 has made the areas it traverses attractive for industrial and residential sites. Although employees have shifted residential locations in order to have better access via I-287 to work, many employees commute from areas well outside the I-287, I-95 corridor. To these persons, I-287 has expanded employment opportunities as well as potential residential sites.

#### Residential Areas

Between 1960 and 1963, authorizations for the construction of dwelling units were consistent, averaging about 2,000 units annually in the municipalities traversed by I-287. Demand increased substantially in 1964 and 1965 when total authorizations in these municipalities increased to 3,068 and 4,469, respectively. Since zoning adjacent to the I-287, I-95 corridor is predominantly industrial, very little residential growth has occurred in this area. Sites adjacent or with easy access to I-287 are preferred by many developers.

Single-family residences located in areas adjacent to I-287 have increased in value by about \$3,000 since 1963. Given as the primary factor influencing this increase was the rapid development of industry in the I-287, I-95 corridor, which has caused demand to increase at a faster rate than supply. There

was no noticeable difference between price or salability of houses adjacent to the highway and those more removed.

In the case of two garden apartment complexes located within one-half mile of I-287, the highway was considered a primary location determinant. Access and the recent industrialization of the corridor were considered the primary attributes of I-287.

In one residential development near I-287, it was believed that about 90 per cent of the residents had formerly resided in the Newark-New York area. Representatives for the other developments estimated that perhaps as much as 50 per cent of their residents were from the Newark-New York area.

All interviewees believed that additional housing development was needed and that Interstate highways provided access to many areas suitable for residential development. In addition, it was felt that current zoning practices in the I-287, I-95 corridor had probably delayed potential residential development of the area.

#### Commercial Centers

For the purposes of this analysis, the Menlo Park Shopping Center in Edison was chosen for study. Since shopping centers are highly automobile oriented, an improvement in the highway system

should have had noticeable effects. Furthermore, since Menlo Park is a regional shopping center, changes in the trade area of businesses in the center would indicate a change in the shopper orientation of the population served by the freeway.

Although little quantitative data were available, management of the sampled establishments indicated that I-287 had effectively expanded their retail markets westward along the route of I-287. This expansion was expressed through an increase in the number of charge accounts opened by residents of these areas and by expanding advertising coverage to these areas. In addition, management cited increased employment of persons living in areas traversed by the freeway. These changes were related to increased accessibility to the areas served by I-287.

#### Tax Revenues

As development occurs in an area, municipal fiscal responsibility increases in terms of revenues and necessary expenditures. Since 1960, municipal expenditures in New Jersey have increased about 7 per cent annually as have revenues. In total, expenditures and revenues have been almost equal throughout the period. Revenues of those municipalities in the I-287, I-95

corridor increased 12 per cent annually and in the other municipalities of Middlesex and Somerset counties increased about 8 per cent.

Another measure indicative of land value and use change is equalized valuation. The corridor municipalities, while having an annual rate increase similar to that of the noncorridor municipalities from 1960 to 1966, showed higher rates since 1963. Three municipalities which have experienced considerable growth attributable to I-287 experienced an increase in the equalized value of land of more than 200 per cent and an increase of 78 per cent for improvements between 1960 and 1967.

#### User Benefits

Users benefit from reduced travel-time and substantial user cost savings particularly on urban freeways as opposed to costs of alternate routes. These savings range from 8.8 per cent for automobiles on rural Interstate highways to 32.1 per cent on urban freeways.

Another saving incurred by freeway users is reduced accident costs. Studies have shown savings between 0.44 and 0.72 cents per vehicle-mile. In nationwide surveys, the accident rate on Interstate highways has been found to be about one half

that on nearby existing highways. In New Jersey, the accident rate on freeways has been found to be less than 25 per cent as high as on state highways.

#### Toll Roads

Until recently, most of the limited access mileage in New Jersey was accounted for by the state's system of toll roads. These highways have engendered many benefits to the people and economy of New Jersey and were the forerunners of today's Interstate System. There are three important toll roads in New Jersey--the New Jersey Turnpike, the Garden State Parkway, and the Atlantic City Expressway. In total, these highways represented an investment of almost \$1,000,000,000. The result was not only a means for moving tremendous numbers of persons but also a pathway of accessibility having important effects on the state's economy and living patterns. Industrial and residential growth has permeated areas served by these highways. The New Jersey Turnpike has caused the industrialization of many areas along its corridor while the Garden State Parkway and the Atlantic City Expressway have revitalized New Jersey's shore area as a national recreation center as well as an area of growing residential and industrial activity.

### Other Impacts

With the continuing development of New Jersey's freeway system virtually every segment of the population will be affected. The effects include both direct benefits to the highway user in the form of cost savings, decreased travel time, and greater safety, and indirect benefits in the form of increased mobility and expanding horizons of economic and social activity.

Among the indirect beneficiaries are the consumer and the manufacturer who realize time and sometimes cost savings resulting from decreased goods transit time and expanded market opportunity.

Increased mobility and accessibility as well as increased automobile ownership has stimulated the development of the shopping center phenomenon. In New Jersey as well as nationally the number of shopping centers has increased rapidly. Because of the nature of their market large shopping centers locate at easily accessible highway locations.

Due to the movement of retailing establishments from the central cities, the downtown areas are experiencing a reinvestment and reorientation as office, government, and service centers. Aid-ed in this development by urban expressways, it is often found that

expressway right-of-way costs are being more than offset by increased tax revenues.

Changes in land use related to suburban expressways have been well documented. Within a given framework, these highways set up a hierarchy of uses with uses yielding the highest return occurring in areas with greatest accessibility with less economic uses developing on remaining sites. Similar to and usually preceding changes in use, land values affected by suburban expressways have been noted to increase rapidly.

Except for urban extensions, freeways usually bypass communities, and it has often been feared that the loss of through traffic would threaten the economic vitality of the community. Various studies have shown that while these fears were not completely unfounded, different factors can influence the extent and character of impact. It was found that business is often well supported locally to a larger degree than expected. In towns with a growing local economy, most losses were soon restored.

In towns where the main street was congested by through traffic, a bypass reduced congestion and thereby induced increased local trade. Accessibility to the bypassed town from the freeway in some cases seemed to be in inverse relation to loss of travel trade. Commercial sites are often developed adjacent to interchanges adding to local investment, employment, income, etc.

Throughout the nation, freeway systems have opened up regional, local, and individual tourist attractions. In recent years, leisure time and increased disposable incomes have resulted in increased recreational activity and increased travel to satisfy these desires. Freeway systems help meet these demands.



**Appendix A**

**MANAGEMENT INTERVIEW FORM**



## Appendix A

### MANAGEMENT INTERVIEW FORM

A single interview form was developed for industrial and commercial firms. The form was divided into six sections each designed to gain specific information on various firm characteristics. A brief description of the sections is included below followed by a sample copy of the form.

Establishment - This section was designed to determine locational characteristics and criteria used in the location decision. Emphasis is on the role of I-287 as a site location factor. Included in this is a subsection for commercial establishments designed to obtain information on business hours, market coverage, and the effect of the I-287, I-95 corridor on business volume.

Investment - Land and building size and cost as well as equipment investment are questions covered in this section.

Employment and Parking - Employment by shift worked, income group, and remuneration characteristics are questions asked here. Also, questions concerning location and accessibility to the labor market and the effect of the highway on employee characteristics and needs are included.

Products and Transportation - These sections are concerned with market orientation and characteristics and mode of transport. Questions concerning changes in transport methods and efficiency are included.

Planned Expansion and Growth - In this section, the interviewee was questioned regarding the adequacy of the present site for future needs, possible plans for expansion or relocation and growth in employment.

FIRMS PARTICIPATING IN THE  
MANAGEMENT INTERVIEW

1. Mack Trucks, Inc.
2. Devro
3. Frank W. Egan & Company
4. The Singer Co., The Diehl Division
5. Johns-Manville Products Corp.-Manufacturing
6. Johns-Manville Products Corp.-Research and Engineering
7. Research-Cottrell, Inc.
8. Eastern Schokcrete Corp.
9. Lofts Pedigreed Seed, Inc.
10. Barrett Division-Allied Chemical Corp.
11. Poly-Fibre Associates
12. Gavin Instruments
13. Holland Rantos Co., Inc.
14. C. R. Bard, Inc.
15. American Cyanamid Co.
16. The Sherwin-Williams Co.
17. Midland-Ross Corp.
18. John Wiley & Sons
19. Tubotron, Inc.
20. Hurty-Peck Eastern, Inc.
21. Cooper-Jarrett Trucking
22. E. R. Squibb & Sons
23. Union Carbide Corp.
24. American Radiator & Standard Sanitary Corp.-  
    Research & Data Processing
25. Colgate-Palmolive Company
26. Fieldcrest Mills, Inc.-Northeast Service Center
27. Pharmacia Laboratories, Inc.
28. Foley Machinery Company
29. Chanel, Inc.
30. The M. W. Kellogg Company-Research & Engineering Development
31. Beecham Corporation
32. Jay R. Smith Manufacturing Co.
33. Union Steel Corporation
34. Neptune World-Wide Moving, Inc.
35. Consolidated Cork Corporation
36. Central Dispatch, Inc.
37. Phoenix Steel Container Co.
38. Tenneco Chemicals
39. Avis Car Rentals, Inc.
40. Fromm Electric

41. Moore's Trucking Co.
42. Tingley Rubber Corp.
43. Victaulic Company of America
44. United Parcel Service
45. Sherman Laboratories
46. American Cholesterol Products, Inc.
47. Lockheed Electronics Company
48. Holophane Co., Inc.
49. Mobil Chemical Company
50. Revlon, Inc.
51. RCA Eastern Products Distribution
52. W. T. Grant Co. Distribution Center
53. Westinghouse
54. S & H Distribution Center
55. Nu-Car Carriers, Inc.
56. Freedman Motor Service, Inc.
57. Ford Motor Company
58. Bamberger's
59. J. C. Penney Co., Inc.

CONFIDENTIAL

INTERVIEW FORM FOR PRINCIPAL INDUSTRIAL AND COMMERCIAL  
ESTABLISHMENTS

Part 1. To be completed by interviewer.

Interviewer: \_\_\_\_\_ Date \_\_\_\_\_

Name of establishment: \_\_\_\_\_

Address of establishment: \_\_\_\_\_

Type of establishment: \_\_\_\_\_

Name of industrial park, shopping center or business area \_\_\_\_\_  
\_\_\_\_\_

I-287 (I-95) direct access interchanges: \_\_\_\_\_

Is there a rail siding? Yes \_\_\_\_\_ No \_\_\_\_\_

Name and title of interviewee: \_\_\_\_\_  
\_\_\_\_\_

Part 2. Information to be supplied by interviewee.

Establishment

1. Is this establishment a
  - A. New branch establishment \_\_\_\_\_.
  - B. Relocated branch establishment \_\_\_\_\_.
  - C. Relocated establishment \_\_\_\_\_.
  - D. New establishment without a previous location \_\_\_\_\_.
2. What was the address of your previous location? \_\_\_\_\_  
\_\_\_\_\_

3. When was this establishment opened at its present location? \_\_\_\_\_

4. Why was your present site chosen? (The list below suggests some, but not all possible considerations) \_\_\_\_\_  
\_\_\_\_\_

Proximity to I-287 (I-95)  
Proximity to other modes  
Accessibility to wholesalers  
Availability to large land parcel  
Business services provided  
Advertising value of high visibility  
Promotional effort  
Accessibility of customers  
Accessibility to labor  
Price of land  
Amenity of surroundings  
Taxes  
Personal reasons  
Greater market coverage

5. Was a formal locational study made? Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, when? \_\_\_\_\_ By whom? \_\_\_\_\_  
Is a copy available for research purposes? \_\_\_\_\_

6. Was knowledge of the route of I-287 (I-95) a significant factor in site selection? Yes \_\_\_\_\_ No \_\_\_\_\_.  
Explain \_\_\_\_\_  
\_\_\_\_\_

(For commercial establishments)

7. What are your business hours? \_\_\_\_\_ A.M. to \_\_\_\_\_ P.M.

8. Can you tell me approximately how many customers you serve annually? \_\_\_\_\_ customers.

9. Have you made a market (or customer) survey? Yes \_\_\_\_\_  
No \_\_\_\_\_. If yes, when? \_\_\_\_\_  
By whom? \_\_\_\_\_ Is a copy available for research purposes? \_\_\_\_\_

A. If no, complete the following: What is the nature of your market? Local \_\_\_\_\_ Regional \_\_\_\_\_. Describe \_\_\_\_\_

10. If this establishment opened prior to the opening of I-287 (I-95) (question #3) has your business volume changed since the opening of I-287 (I-95)?  
Yes \_\_\_\_\_ No \_\_\_\_\_. Explain \_\_\_\_\_

Investment

1. What is the company's approximate investment in land? \_\_\_\_\_  
sq. ft. X \_\_\_\_\_ cost/sq. ft.  
= \_\_\_\_\_ Total.  
Buildings \_\_\_\_\_.  
Equipment \_\_\_\_\_.  
Sq. ft. of buildings \_\_\_\_\_.

Employment and Parking

1. What was the approximate total number of employees at your previous establishment \_\_\_\_\_.

2. What have you found the effects to be from locating on I-287 (I-95) on employee procurement insofar as:

A. Commuting problems of employees? \_\_\_\_\_

B. The change in the potential labor market with respect to quantity and quality? \_\_\_\_\_

C. Improved employee facilities available? \_\_\_\_\_

3. How many shifts does your company employ?  
One \_\_\_\_\_ two \_\_\_\_\_ three \_\_\_\_\_.

4. What are the hours of each shift?  
Shift 1 \_\_\_\_\_ Shift 2 \_\_\_\_\_ Shift 3 \_\_\_\_\_

5. What are the number of employees on each shift?

Shift 1 \_\_\_\_\_ Shift 2 \_\_\_\_\_ Shift 3 \_\_\_\_\_

6. Do you think that your present location is well situated with regard to your labor market? Yes \_\_\_\_\_ No \_\_\_\_\_  
Why? \_\_\_\_\_

7. What is your current employment by category?

Salaried \_\_\_\_\_ Hourly \_\_\_\_\_ Total \_\_\_\_\_.

Date of figures \_\_\_\_\_.

8. How many persons do you presently employ that fall within the following income ranges?

Below \$5,000 \_\_\_\_\_ \$ 5,000 - \$ 6,999 \_\_\_\_\_  
\$ 7,000 - \$9,999 \_\_\_\_\_ \$10,000 - \$14,999 \_\_\_\_\_  
\$15,000 - over \_\_\_\_\_

9. Did your employee parking situation improve?

Yes \_\_\_\_\_ No \_\_\_\_\_

Products

1. Where do your products or services go from this firm in terms of per cent of total dollar sales?

A. Immediate area (25-mile radius) \_\_\_\_\_ per cent  
B. N.J.-N.Y. Metropolitan Area \_\_\_\_\_ per cent  
C. U.S. (Outside N.J.-N.Y. Metro.) \_\_\_\_\_ per cent  
D. Foreign Countries \_\_\_\_\_ per cent

2. Where do products delivered to this firm come from in terms of per cent of total dollar purchases?

A. Immediate area (25-mile radius) \_\_\_\_\_ per cent  
B. N.J.-N.Y. Metropolitan Area \_\_\_\_\_ per cent  
C. U.S. (Outside N.J.-N.Y. Metro.) \_\_\_\_\_ per cent  
D. Foreign Countries \_\_\_\_\_ per cent

## Transportation

1. Since the opening of I-287 (I-95) what changes have occurred in your method of transporting your raw materials (stock goods) and finished goods (retail deliveries).

A.	Raw materials (stock goods)	Rail	Truck
1.)	Prior to I-287 (I-95)	____%	____%
2.)	After opening of I-287 (I-95)	____%	____%
B.	Finished goods (retail deliveries)		
1.)	Prior to I-287 (I-95)	____%	____%
2.)	After opening of I-287 (I-95)	____%	____%

2. Do you use your own trucks for the pickup or delivery of raw materials, finished goods, products, or services?  
Yes \_\_\_\_\_ No \_\_\_\_\_ Number of trucks

A. If yes, can you tell me the total number miles traveled by these trucks per year? \_\_\_\_\_.  
Increasing? Yes \_\_\_\_\_ No \_\_\_\_\_.  
By what percentage per year? \_\_\_\_%  
Note: If annual mileage figures are available obtain for several years.

B. Can you estimate the average number of miles your trucks utilize I-287 (I-95). Yes \_\_\_\_\_ No \_\_\_\_\_. \_\_\_\_\_ miles.

C. Are there any hours of the day in which this trucking is concentrated? \_\_\_\_\_ A.M., P.M.

D. If no, to number 2 above, what per cent of the trucks entering and leaving this business use I-287 (I-95)?  
Entering \_\_\_\_\_ % Leaving \_\_\_\_\_ %

3. Have you made any changes in your routings of deliveries or pickups since the opening of I-287 (I-95)?

Yes \_\_\_\_\_ No \_\_\_\_\_ Describe: \_\_\_\_\_  
\_\_\_\_\_

4. Has I-287 (I-95) caused any change in the speed of delivery or distribution from this site? Yes \_\_\_\_\_ No \_\_\_\_\_  
Describe: \_\_\_\_\_

5. Has I-287 (I-95) caused any changes in the speed of delivery to this site? Yes \_\_\_\_\_ No \_\_\_\_\_ Describe \_\_\_\_\_

6. If this firm is primarily in the business of transporting goods, complete the following:

A. What type of carrier or service if offered:

1.) Common carrier \_\_\_\_\_  
2.) Private carrier \_\_\_\_\_  
3.) Contract carrier \_\_\_\_\_  
4.) Mover of household or office furnishings \_\_\_\_\_  
5.) Parcel or messenger service \_\_\_\_\_  
6.) Freight forwarder and/or consolidator \_\_\_\_\_  
7.) Other (specify) \_\_\_\_\_

Note: If more than one type of service is offered, determine percentage of total business by dollar volume.

1.) \_\_\_\_\_ 2.) \_\_\_\_\_  
3.) \_\_\_\_\_ 4.) \_\_\_\_\_ 5.) \_\_\_\_\_  
6.) \_\_\_\_\_ 7.) \_\_\_\_\_

#### Planned Expansion and Growth

1. Is your present site adequate for your future needs?  
Yes \_\_\_\_\_ No \_\_\_\_\_

2. What do you anticipate your employment to be at this site by 1975? \_\_\_\_\_

3. Do you have plans for expansion? Yes \_\_\_\_\_ No \_\_\_\_\_  
If yes, will expansion occur on your present site?  
Another \_\_\_\_\_, or both \_\_\_\_\_.  
Note: If expansion is planned on present site; complete questions 4, 5; if another site, 6-9; if both 4-9.

4. Why will expansion take place on this site? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. Anticipated date(s) of completion (If more than one distinct stage of expansion is planned, please indicate multiple dates.) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

6. Why have you chosen to expand at a new site? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

7. If a new site has been selected, would it be possible to give the location? (as specific as possible) \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

8. What are the primary reasons for selecting your new site?  
\_\_\_\_\_  
\_\_\_\_\_



## Appendix B

### THE EMPLOYEE QUESTIONNAIRE



## Appendix B

### THE EMPLOYEE QUESTIONNAIRE

The employee questionnaire contained seven questions.

A brief description of these questions follows.

Question 1 asked the residence address of the employee.

These data were coded to zones delineated for analytical purposes.

Question 2 asked the amount of time usually taken in the trip to work. The wording was specific in asking for the home-to work-time, because this trip was believed to be more consistent in mode and route than the return from work to home.

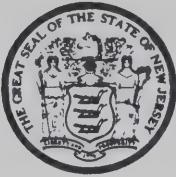
Question 3 asked whether the normal mode of transport for the home to work trip was automobile or by some other means. Of the very few who check "other," most indicated either bus or train as the primary mode.

Question 4 asked automobile users how many persons, including themselves, were normally in the car. This question was worded carefully to avoid misinterpretation. The respondent was asked whether he was the driver in today's carpool. It was felt that this would provide the most realistic measure of automobile occupancy.

Question 5 was in two parts. A simple yes or no question was asked with regard to use of I-287. I-287 users were then asked to indicate the interchanges they took to get on and off the facility on both the to and from work trip. In this way, average distance traveled on I-287 could be calculated, and the route of the entire trip could be estimated.

Question 6 asked the employee what his normal work hours were.

Question 7 asked whether the employee had changed his place of residence since starting work at his particular plant. If yes, he was asked if I-287 was used in commuting to work from his prior residence.



**State of New Jersey  
DEPARTMENT OF TRANSPORTATION  
DAVID J. GOLDBERG, COMMISSIONER**

**A SOCIOECONOMIC STUDY OF HIGHWAY DEVELOPMENT**

Dear Commuter:

The New Jersey Department of Transportation has arranged for this study of the use of I-287 (I-95) as part of its program of factual evaluation of modern controlled access highways. The attached form is designed to provide essential information on your use of I-287 (I-95). This information will be used in the planning and design of highways to provide the best possible service to New Jersey Commuters.

Please complete this form and return it to your Personnel Office at your earliest convenience. The information furnished by you will be held confidential.

Thank you for your cooperation.

DAVID J. GOLDBERG  
Commissioner of Transportation



## A SOCIOECONOMIC STUDY OF HIGHWAY DEVELOPMENT

Conducted for  
New Jersey Department of Transportation  
by  
Wilbur Smith and Associates, Consultants

### CONFIDENTIAL EMPLOYEE QUESTIONNAIRE

WSA 11/67  
Firm Number

This Column For  
Official Use Only

<input type="checkbox"/>				
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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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1. Residence street address.  
(One hundred block and street, e.g., 15100 block of Ash Street)

City or County\_\_\_\_\_

State\_\_\_\_\_ Zip Code\_\_\_\_\_

2. How long does it usually take you to travel from home to work? \_\_\_\_\_ minutes.

3. What method of transportation do you usually use for the greatest portion of your trip from home to work? Automobile\_\_\_\_ Other \_\_\_\_ (Specify)\_\_\_\_\_

4. If you usually travel by automobile, do you belong to a carpool? Yes\_\_\_\_ No\_\_\_\_

A. If yes, were you the driver in today's carpool? Yes\_\_\_\_ No\_\_\_\_

B. If yes, how many persons including yourself were in the car? \_\_\_\_persons.

5. In traveling to and/or from work do you use I-287 (I-95)? Yes\_\_\_\_ No\_\_\_\_  
If yes please indicate entrances and exits used in traveling to and from work on I-287 (I-95)

TO WORK		INTERCHANGE	FROM WORK	
Enter	Exit		Enter	Exit
<input type="checkbox"/>	<input type="checkbox"/>	U. S. 1 (Metuchen)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	N. J. 27 (Lincoln Highway)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	501 (New Durham Road)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Durham Avenue	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	529 (Stelton Road)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Washington Avenue	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	South Randolph Road	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Possumtown Road	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	N. J. 18 (River Road Alternate)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	527 (Main Street)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Weston Canal Road	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	28 (Union Avenue)	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	U. S. 22 (Somerville)	<input type="checkbox"/>	<input type="checkbox"/>

6. At the present time, what are your normal work hours? Begin\_\_\_\_ a.m. p.m.  
End\_\_\_\_ a.m. p.m.

7. Have you moved since going to work at this plant? Yes\_\_\_\_ No\_\_\_\_

A. If yes, did you use I-287 (I-95) in commuting to work from your previous place of residence? Yes\_\_\_\_ No\_\_\_\_

## Appendix C

PARTICIPATING ESTABLISHMENTS--EMPLOYMENT SIZE CLASS  
AND PER CENT OF USABLE QUESTIONNAIRES



Appendix C

PARTICIPATING ESTABLISHMENTS--EMPLOYMENT SIZE CLASS  
AND PER CENT OF USABLE QUESTIONNAIRES

<u>FIRM NAME</u>	<u>EMPLOYMENT SIZE CLASS<sup>(2)</sup></u>	<u>PER CENT RETURN OF USABLE QUESTIONNAIRES<sup>(3)</sup></u>
1. Mack Trucks*	(5)	18.5
2. Devro*	(4)	39.2
3. Frank W. Egan & Co.*	(5)	55.2
4. Singer*	(5)	36.3
5. Johns-Manville-Mfg.	(6)	
6. Johns-Manville-Research*	(6)	37.6
7. Research-Cottrell*	(4)	52.1
8. Eastern Schokcrete*	(3)	38.8
9. Lofts Pedigreed Seed	(2)	18.0
10. Barrett Div.-Allied Chemical*	(1)	76.9
11. Poly-Fibre	(1)	
12. Gavin Instruments	(3)	
13. Holland Rantos*	(2)	70.7
14. C. R. Bard, Inc.	(3)	19.0
15. American Cyanamid Co.	(6)	29.9
16. Sherwin-Williams	(2)	3.8
17. Midland-Ross	(4)	
18. John Wiley & Sons*	(3)	27.1
19. Tubotron*	(1)	93.3
20. Hurty-Peck	(1)	25.0
21. Cooper-Jarrett	(2)	
22. E. R. Squibb*	(2)	36.0
23. Union Carbide	(6)	
24. American-Standard*	(4)	66.8
25. Colgate-Palmolive*	(4)	73.1
26. Fieldcrest	(1)	
27. Pharmacia Laboratories*	(1)	80.0
28. Foley Machinery*	(3)	35.4
29. Chanel*	(3)	29.0
30. M. W. Kellogg*	(3)	55.5
31. Beecham Corp.*	(3)	37.1
32. Jay R. Smith Mfg. <sup>(1)</sup>		
33. Union Steel*	(4)	23.1
34. Neptune World-Wide Moving	(1)	
35. Consolidated Cork	(3)	
36. Central Dispatch	(1)	
37. Phoenix Steel	(2)	
38. Tenneco Chemicals*	(4)	42.7

<u>FIRM NAME</u>	<u>EMPLOYMENT SIZE CLASS</u> <sup>(2)</sup>	<u>PER CENT RETURN OF USABLE QUESTIONNAIRES</u> <sup>(3)</sup>
39. Avis	(2)	
40. Fromm Electric	(1)	
41. Moore's Trucking	(3)	
42. Tingley Rubber*	(4)	36.0
43. Victaulic	(3)	
44. United Parcel Serv.	(1)	
45. Sherman Laboratories	(1)	
46. American Cholesterol	(2)	
47. Lockheed	(3)	
48. Holophane	(2)	
49. Mobile Chemical Co.*	(4)	38.1
50. Revlon	(6)	
51. RCA	(5)	
52. W. T. Grant	(3)	16.0
53. Westinghouse	(6)	3.6
54. S & H Distribution	(3)	19.3
55. Nu-Car Carriers	(4)	
56. Freedman Motor	(2)	
57. Ford Motor Co.	(6)	
58. Bamberger's <sup>(1)</sup>		
59. J. C. Penney <sup>(1)</sup>		

(1) Confidential.

(2) Employment size class:

1 =	0 - 49
2 =	50 - 99
3 =	100 - 249
4 =	250 - 499
5 =	500 - 999
6 =	1,000 +

(3) Number of questionnaires returned as a percentage of number distributed.

\* Included in sample.

## Appendix D

### CODING INSTRUCTIONS FOR EMPLOYEE QUESTIONNAIRE



## Appendix D

### CODING INSTRUCTIONS FOR EMPLOYEE QUESTIONNAIRE

Appendix D contains the coding instructions for the employee questionnaire. The coded data were then transferred to punch cards, and all data tabulations were completed by electronic computer. The data card format is also included in this Appendix. Along with the coding instructions is a rather lengthy list of all residence zones used in this analysis. Two characteristics of this residence zone list should be considered. The first two digits of the code represent the county of residence; the last two digits, the municipality sequence number where applicable. In two cases, municipalities which were bisected by I-287 were given two code numbers representing the area on either side of the highway. These bisected municipalities included Piscataway Township, Edison Township, and Bridgewater Township.

DATA CARD FORMAT  
OF THE  
EMPLOYEE QUESTIONNAIRE

<u>FIELD</u>	<u>ITEM</u>	<u>COLUMNS</u>
1	Blank	1
2	County	2
3	Industry Type	3
4	Establishment Number	4,5
5	Blank	6,7
6	Analysis Zone	8-12
7	Blank	13,14
8	Zip Code	15-19
9	Blank	20,21
10	Travel Time	22-24
11	Blank	25,26
12	Method of Travel	27
13	Blank	28
14	Carpool	29
15	Blank	30
16	Carpool Driver	31
17	Blank	32
18	Number of Persons	33
19	Blank	34
20	Use of I-287 (I-95)	35
21	Blank	36
22	To Work Entrance	37,38
23	To Work Exit	39,40
24	From Work Entrance	41,42
25	From Work Exit	43,44
26	Blank	45,46
27	Begin Work Hour	47-49
28	Blank	50,51
29	End Work Hour	52-54
30	Blank	55,56
31	Residence Relocation	57
32	Blank	58
33	Use of I-287 (I-95) Before Move	59

## CONFIDENTIAL EMPLOYEE QUESTIONNAIRE

CODING INSTRUCTIONS

<u>FIELD</u>	<u>QUESTION NUMBER</u>	<u>ITEM</u>	<u>COLUMN NUMBER</u>
2		County, Middlesex = 1 Somerset = 2	2
3		Industry type, Manufacturing = 1 Distribution = 2 Research and Development = 3 Retail and Wholesale Sales = 4 Transportation = 5	3
4		Establishment sequence number = 01-99	4,5
6	1	Analysis zone, using results to question 1 each township, borough, or municipality or county is assigned an identification number. These identification numbers are included in Code Appendix A	8-12
8	1	Zip code, each respondent was asked to supply in addition to his address, the local zip code to aid in the further identification of his residence. To find the area represented by a zip code or to find the zip code of an area the National ZIP CODE DIRECTORY should be consulted.	
10	2	Travel time: Results of question 2 in minutes, entered as a maximum of three digits.	22-24
12	3	Method of travel: Coded in the following manner: Auto = 1 Train = 2 Taxi = 3 Bus = 4 Walk = 5 Other = 6	27

<u>FIELD</u>	<u>QUESTION NUMBER</u>	<u>ITEM</u>	<u>COLUMN NUMBER</u>
14	4	Carpool membership: Yes = 1 No = 2	29
16	4A	Carpool driver: Yes = 1 No = 2	31
18	4B	Number of Persons in Car: single digit number from 2 to 9	33
20	5	Use of I-287 (I-95) in traveling to and/or from work: Yes = 1 No = 2	35
22, 23, 24, 25	5	Entrances and exits of I-287 (I-95) used in traveling to and/or from work should be coded in the following manner:  U. S. 1 (Metuchen) = 00 N. J. 27 (Lincoln Highway) = 01 501 (New Durham Road) = 02 Durham Avenue = 03 529 (Stelton Road) = 04 Washington Avenue = 05 South Randolphville Road = 06 Possumtown Road = 07 N. J. 18 (River Road Alternate) = 08 527 (Main Street) = 09 Weston Canal Road = 10 28 (Union Avenue) = 11 U. S. 22 (Somerville) = 12 U. S. 202, 206 (Somerville Road) = 13      37,38 I-78 (Pluckemin) = 14      39,40 U. S. 202, 206 (Bedminster) = 15      41,42 525 (Mount Airy Road) = 16      43,44	

Numbers 13-16 were not included on the questionnaire form, however, a few employees did indicate using these interchanges. In such cases they should be coded as above.

<u>FIELD</u>	<u>QUESTION NUMBER</u>	<u>ITEM</u>	<u>COLUMN NUMBER</u>
27	6	Begin work hour: Coded as a three digit number. The first two digits represent the hour on a 24 hour basis. The last digit represents the time to the nearest 10 minutes. A few examples follow: 8:30 A.M. would be coded as 083 9:25 A.M. 093 10:10 A.M. 101 4:40 P.M. 164 9:50 P.M. 215	47-49
29	6	End work hour: Would be coded in the same manner as begin work hour.	52-54
31	7	Residence relocation: Yes = 1 No = 2	57
33	7	Use of I-287 (I-95) before move: Yes = 1 No = 2	59

CODING INSTRUCTIONS FOR RESIDENCE ZONES

<u>COUNTY, TOWNSHIP, MUNICIPALITY OR BOROUGH</u>	<u>IDENTIFICATION NUMBER</u>
Atlantic County	0100
Bergen County	0200
Burlington County	0300
Camden County	0400
Cape May County	0500
Cumberland County	0600
Essex County	0700
Gloucester County	0800
Hudson County	0900
Hunterdon County	1000
Alexandria Township	1001
Bethlehem Township	1002
Bloomsbury Borough	1003
Califon Borough	1004
Clinton Town	1005
Clinton Township	1006
Delaware Township	1007
East Amwell Township	1008
Flemington Borough	1009
Franklin Township	1010
Frenchtown Borough	1011
Glen Gardner Borough	1012
Hampton Borough	1013
High Bridge Borough	1014
Holland Township	1015
Kingswood Township	1016
Lambertville City	1017
Lebanon Borough	1018
Lebanon Township	1019
Milford Borough	1020
Raritan Township	1021
Readington Township	1022
Stockton Borough	1023
Tewksbury Township	1024
Union Township	1025
West Amwell Township	1026

COUNTY, TOWNSHIP,  
MUNICIPALITY OR BOROUGH

IDENTIFICATION NUMBER

Mercer County	1100
East Windsor Township	1101
Ewing Township	1102
Hamilton Township	1103
<u>    Hightstown Borough</u>	<u>1104</u>
Hopewell Borough	1105
Hopewell Township	1106
Lawrence Township	1107
Pennington Borough	1108
<u>    Princeton Borough</u>	<u>1109</u>
Princeton Township	1110
Trenton City	1111
Washington Township	1112
West Windsor Township	1113
<u>Middlesex County</u>	<u>1200</u>
Carteret Borough	1201
Cranbury Township	1202
Dunellen Borough	1203
East Brunswick Township	1204
<u>    North Edison Township</u>	<u>1205</u>
South Edison Township	1206
Helmetta Borough	1207
Highland Park Borough	1208
Jamesburg Borough	1209
<u>    Madison Township</u>	<u>1210</u>
Metuchen Borough	1211
Middlesex Borough	1212
Milltown Borough	1213
Monroe Township	1214
<u>    New Brunswick City</u>	<u>1215</u>
North Brunswick Township	1216
Perth Amboy City	1217
North Piscataway Township	1218
South Piscataway Township	1219
<u>    Plainsboro Township</u>	<u>1220</u>
Sayreville Borough	1221
South Amboy City	1222
South Brunswick Township	1223
South Plainfield Borough	1224
South River Borough	1225

COUNTY, TOWNSHIP,  
MUNICIPALITY OR BOROUGH

IDENTIFICATION NUMBER

Middlesex County (cont'd)	
Spotswood Borough	1226
Woodbridge Township	1227
<u>Monmouth County</u>	<u>1300</u>
Allenhurst Borough	1301
Allentown Borough	1302
Asbury Park City	1303
Atlantic Township	1304
<u>Atlantic Highlands Borough</u>	<u>1305</u>
Avon-By-the-Sea Borough	1306
Belmar Borough	1307
Bradley Beach Borough	1308
Brielle Borough	1309
<u>Deal Borough</u>	<u>1310</u>
Eatontown Borough	1311
Englishtown Borough	1312
Fair Haven Borough	1313
Farmingdale Borough	1314
<u>Freehold Borough</u>	<u>1315</u>
Freehold Township	1316
Highlands Borough	1317
Holmdel Township	1318
Howell Township	1319
<u>Interlaken Borough</u>	<u>1320</u>
Keansburg Borough	1321
Keyport Borough	1322
Little Silver Borough	1323
Loch Arbour Village	1324
<u>Long Branch City</u>	<u>1325</u>
Manalapan Township	1326
Manasquan Borough	1327
Marlboro Township	1328
Matawan Borough	1329
<u>Matawan Township</u>	<u>1330</u>
Middletown Township	1331
Millstone Township	1332
Monmouth Beach Borough	1333
Neptune Township	1334
Neptune City Borough	1335

COUNTY, TOWNSHIP,  
MUNICIPALITY OR BOROUGH

IDENTIFICATION NUMBER

Monmouth County (cont'd)

New Shrewsbury Borough	1336
Ocean Township	1337
Oceanport Borough	1338
Raritan Township	1339
Red Bank Borough	1340
Roosevelt Borough	1341
Rumson Borough	1342
Sea Bright Borough	1343
Sea Girt Borough	1344
<u>Shrewsbury Borough</u>	<u>1345</u>
Shrewsbury Township	1346
South Belmar Borough	1347
Spring Lake Borough	1348
Spring Lake Heights Borough	1349
<u>Union Beach Borough</u>	<u>1350</u>
Upper Freehold Township	1351
Wall Township	1352
West Long Branch Borough	1353
<u>Morris County</u>	<u>1400</u>
Boonton Town	1401
Boonton Township	1402
Butler Borough	1403
Chatham Borough	1404
<u>Chatham Township</u>	<u>1405</u>
Chester Borough	1406
Chester Township	1407
Denville Township	1408
Dover Town	1409
<u>East Hanover Township</u>	<u>1410</u>
Florham Park Borough	1411
Hanover Township	1412
Harding Township	1413
Jefferson Township	1414
<u>Kinnelon Borough</u>	<u>1415</u>
Lincoln Park Borough	1416
Madison Borough	1417
Mendham Borough	1418
Mendham Township	1419

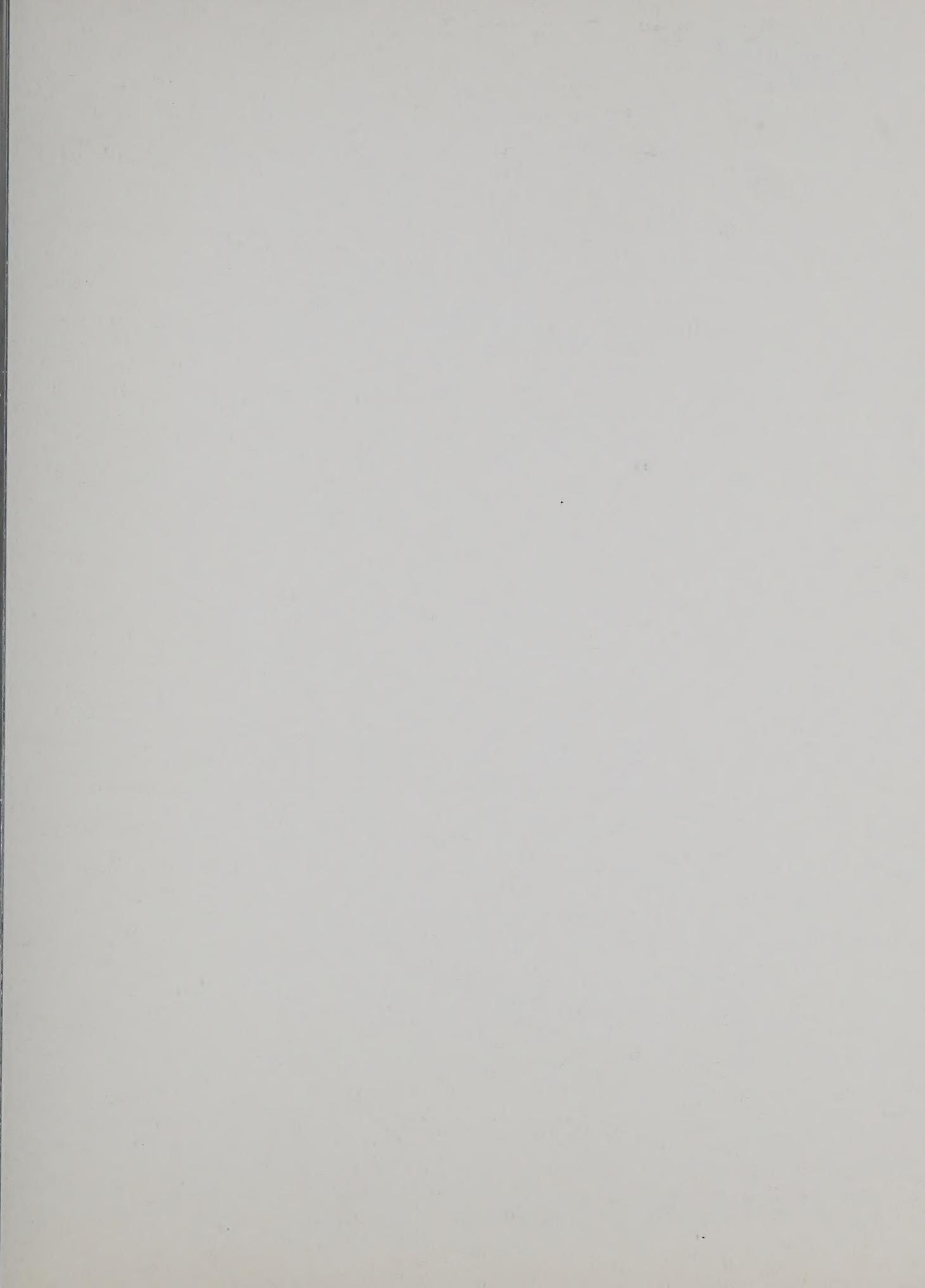
COUNTY, TOWNSHIP  
MUNICIPALITY OR BOROUGH

IDENTIFICATION NUMBER

Morris County (cont'd)	
Nine Hill Township	1420
Montville Township	1421
Morris Township	1422
Morris Plains Borough	1423
Morristown Town	1424
Mountain Lakes Borough	1425
Mount Arlington Borough	1426
Mount Olive Township	1427
Netcong Borough	1428
Parsippany-Troy Hills Township	1429
Passaic Township	1430
Pequannock Township	1431
Randolph Township	1432
Riverdale Borough	1433
Rockaway Borough	1434
Rockaway Township	1435
Roxbury Township	1436
Victory Gardens Borough	1437
Washington Township	1438
Wharton Borough	1439
Ocean County	1500
Passaic County	1600
Salem County	1700
Somerset County	1800
Bedminster Township	1801
Bernards Township	1802
Bernardsville Borough	1803
Bound Brook Borough	1804
Branchburg Township	1805
East Bridgewater Township	1806
West Bridgewater Township	1807
Far Hills Borough	1808
Franklin Township	1809
Green Brook Township	1811
Manville Borough	1812
Millstone Borough	1813
Montgomery Township	1814
North Plainfield Borough	1815

<u>COUNTY, TOWNSHIP, MUNICIPALITY OR BOROUGH</u>	<u>IDENTIFICATION NUMBER</u>
Somerset County (cont'd)	
Peapack-Gladstone Borough	1816
Raritan Borough	1817
Rocky Hill Borough	1818
Somerville Borough	1819
South Bound Brook Borough	1820
Warren Township	1821
Watchung Borough	1822
Hillsborough	1823
Sussex County	1900
Union County	2000
Berkeley Heights Township	2001
Clark Township	2002
Cranford Township	2003
Elizabeth City	2004
Fanwood Borough	2005
Garwood Borough	2006
Hillside Township	2007
Kenilworth Borough	2008
Linden City	2009
Mountainside Borough	2010
New Providence Borough	2011
Plainfield City	2012
Rahway City	2013
Roselle Borough	2014
Roselle Park Borough	2015
Scotch Plains Township	2016
Springfield Township	2017
Summit City	2018
Union Township	2019
Westfield Town	2020
Winifield Township	2021
Warren County	2100
Bronx County, New York	2200
Kings County, New York	2300
Nassau County, New York	2400
New York County, New York	2500
Putnam County, New York	2700
Queens County, New York	2800
Richmond County, New York	2900

<u>COUNTY, TOWNSHIP, MUNICIPALITY OR BOROUGH</u>	<u>IDENTIFICATION NUMBER</u>
Rockland County, New York	3000
Suffolk County, New York	3100
Westchester County, New York	3200
Berks County, Pennsylvania	3300
<u>Bucks County, Pennsylvania</u>	<u>3400</u>
Carbon County, Pennsylvania	3500
Chester County, Pennsylvania	3600
Delaware County, Pennsylvania	3700
Lehigh County, Pennsylvania	3800
<u>Monroe County, Pennsylvania</u>	<u>3900</u>
Montgomery County, Pennsylvania	4000
Northampton County, Pennsylvania	4100
Philadelphia County, Pennsylvania	4200
Pike County, Pennsylvania	4300





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